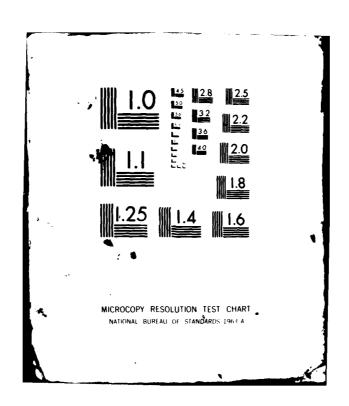
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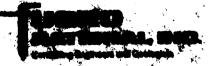


MX SITING INVESTIGATION GEOTECHNICAL EVALUATION

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AGGREGATE RESOURCES REPORT UTAH-NEVADA STUDY AREA

PREPARED FOR BALLISTIC MISSILE OFFICE (BMO) NORTON AIR FORCE BASE, CALIFORNIA



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AGGREGATE RESOURCES REPORT UTAH-NEVADA STUDY AREA

Prepared for:

U.S. Department of the Air Force Ballistic Missile Office (BMO) Norton Air Force Base, California 92409

Prepared by:

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3 March 1980

FOREWORD

This report was prepared for the Department of the Air Force Ballistic Missile Office (BMO) in compliance with Contract No. F-04704-80-C-0006, CDRL Item No. 005A2. It presents the results of a preliminary aggregate resources investigation within and adjacent to selected lands in Utah and Nevada that are under consideration for siting the MX system. The program was funded in June FY 79 through supplemental funding of the FY 79 Geotechnical Program.

Results of the investigation are presented in this volume as text, appendices, and two drawings.

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1.0 INTRODUCTION

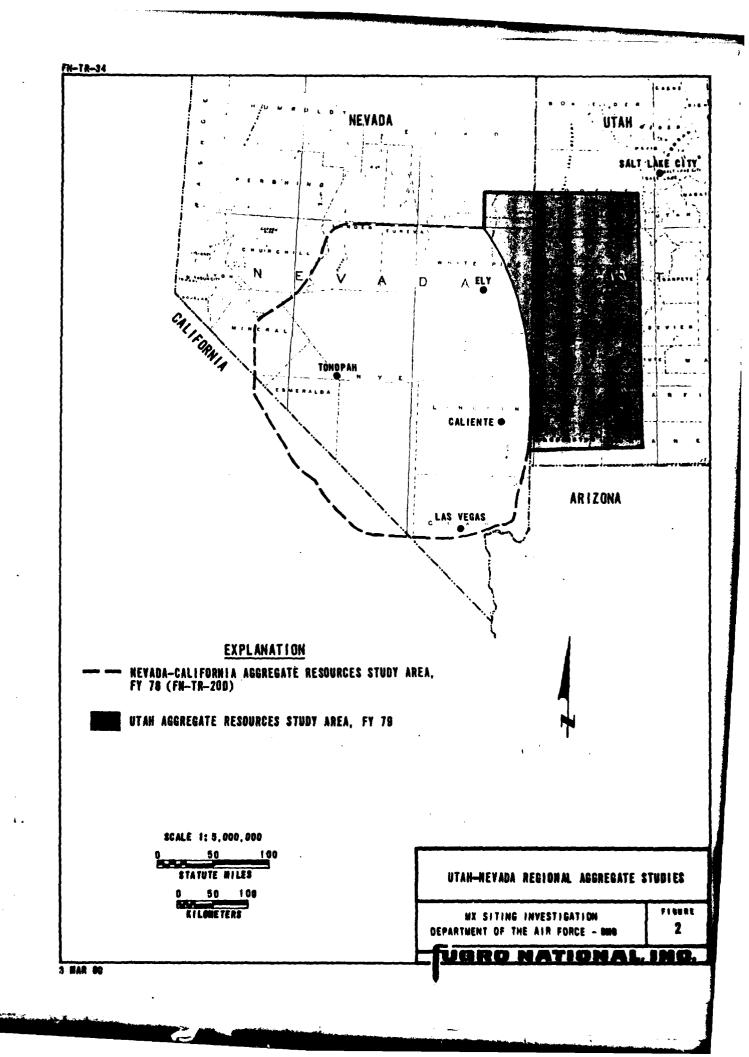
1.1 BACKGROUND

The MX aggregate program began in 1977 with the investigation of Department of Defense (DOD) and Bureau of Land Management (BLM) lands in California, Nevada, Arizona, New Mexico, and Texas (FN-TR-20D). This program identified, on a selected regional basis, potential sources of concrete aggregate that could be used for construction of the MX system and ranked them according to suitability. Economic factors (e.g., mining costs, haul distances, etc.) were not considered.

Refinement of the potential MX siting area in FY 79 added portions of Utah and Nevada that were not studied in the initial Aggregate Resource Evaluation Investigation (AREI) of the Nevada-California areas (Figure 1). This additional area (Figure 2) was defined as the Utah-Nevada Aggregate Resources Study Area (UARSA).

1.2 OBJECTIVES

The primary objective of the Utah-Nevada Aggregate Resources Study is to bring the entire, currently defined potential siting area to a similar level of aggregate investigation. The principal effort is to preliminarily inventory and rank sand, gravel, and rock resources according to their suitability for use as aggregate in concrete (3- to 7.5-kips-per-square-inch compressive strength), railroad ballast, and road base. The initial aggregate study, FN-TR-20D, inventoried and ranked sand,



gravel, and rock resources according to their suitability for use as aggregate in concrete to be used in construction of the MX trench system.

Factors which influenced inventory procedures and the ranking of the sources included:

- Type of deposit: Both rock and basin fill were investigated as potential aggregate sources.
- 2) Quality of the material: American Society of Testing and Materials (ASTM) standards and Standard Specifications for Public Works Construction (SSPWC) were used to evaluate aggregate quality.
- 3) Quantity of material: 86.9×10^6 tons of gravel and 5.8×10^6 tons of sand are estimated to be required for construction of the presently conceived MX horizontal MPS system.
- 4) Size of boundary extension: An approximate 30-mile boundary extension around potential suitable siting area was based on current estimates pertaining to the maximum practical and economical haul distance anticipated for the MX system.
- 5) Availability of water for aggregate processing: A brie! review of existing data on ground and surface water within the study area and visual observations at field station stops were performed.
- 6) Accessibility: A brief review of major land transportation facilities within the study area and visual observations at field station stops were performed.

This study was designed to provide regional information on the general location, quality, and quantity of aggregate and construction material resources (sand, gravel, and rock) within the study area in a useful and informative format for planning purposes. Detailed information on the actual location and development of proven available suitable aggregate sources was beyond the scope of this study.

1.3 SCOPE

The scope of this investigation required that both office studies and field reconnaissances be performed. The following pertinent steps were included in the investigation:

- Collection of available existing data on the quality and quantity of potential concrete aggregate, railroad ballast, and road base sources.
- 2) Analysis and evaluation of collected data with subsequent selection of areas for field reconnaissances.
- 3) Aerial and ground field reconnaissances of representative basin-fill and rock aggregate sources with sampling of selected representative materials.
- 4) Limited laboratory testing to supplement available existing data and to provide sufficiently detailed information to assist in predicting suitability of potential aggregate resources over broad areas.
- 5) Preliminary review of existing data on water availability and land transportation facilities within the study area.
- 6) Application of the aggregate resources preliminary ranking system developed during the initial aggregate investigation. This system utilizes ASTM and SSPWC standards and specifications.

2.0 STUDY APPROACH

2.1 METHODOLOGY

The study approach was to 1) utilize, to the maximum extent possible, existing data on aggregate sources in the area, 2) supplement the existing data with limited field reconnaissances including collection of representative potential aggregate source materials for laboratory testing, and 3) assess critical physical/chemical properties to support the results of the inventory and ranking.

2.1.1 Existing Data

Collection of existing test data from available sources was a primary factor controlling the study approach. Data were collected from federal, state, and private agencies, institutions, and individuals in Reno, Carson City, and Ely, Nevada, and Salt Lake City, Cedar City, and Richfield, Utah. Principal sources of data directly pertaining to concrete aggregate or related construction materials were the State Highway Departments of Nevada and Utah. The majority of this information is related to the use of aggregate material for asphaltic concrete, base course in road construction, or ballast material. Many of the suitability tests for these types of construction materials are similar to those for concrete aggregate.

2.1.2 Supplemental Field Data

Aerial and ground reconnaissances of the study area were made to collect additional data and to verify conditions determined during the review of existing information. During this phase,

192 basin-fill and rock field station data stops were made in potential aggregate sources as well as existing quarries and borrow pits. Identification of basin-fill materials in the field followed ASTM D2488-69 Description of Soils (Visual-Manual Procedure), and the Unified Soil Classification System (Appendix C). Rock identifications followed procedures described in the Quarterly of the Colorado School of Mines and Standard Investigative Nomenclature of Constituents of Natural Mineral Aggregates (ASTM C294-69).

Selected sources were sampled for additional laboratory testing and/or petrographic thin section analysis. Representative basin-fill samples were collected by channel sampling stream cuts or man-made exposures. Rock samples were obtained from exposures of fresh or slightly weathered material whenever possible. The weight of the samples collected ranged between 100 and 150 pounds. Samples collected for thin sectioning were hand specimens, generally not exceeding five pounds in weight.

2.1.3 Data Analysis

Engineering and geologic criteria were used to analyze and evaluate the existing and field data. This was supplemented by selected laboratory tests (Table 1) and petrographic thin section examinations which emphasized a determination of durability, soundness, and gradation. Because materials suitable for use as concrete aggregate are generally acceptable for use as railroad ballast and road base, concrete aggregate parameters are the principal consideration in this report.

AGGREGATE CLASSIFICATION	ASTM TEST	SAMPLE TYPE AND NUMBER OF TESTS	
COARSE	ASTM C-88; SOUNDNESS BY USE OF MAGNESIUM SULFATE	ROCK (7) Gravel (6)	
	ASTM C-131; RESISTANCE TO ABRASION BY USE OF THE LOS ANGELES MACHINE	ROCK (7) Gravel (6)	
	ASTM C-136; Sieve analysis	GRAVEL (7)	
FINE	ASTM C-88; SOUNDNESS BY USE OF MAGNESIUM SULFATE	SAND (4)	
	ASTM C-136; SIEVE ANALYSIS	SAND (1)	

AGGREGATE TESTS UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - DAME

TABLE

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2.1.4 Presentation of Results

Results of the study are presented in text form, tables, two 1:500,000 scale maps, and appendices. The aggregate resources map (Drawing 1) shows the location, type, and rank of all Class A and Class B aggregate sources (Section 2.2, Preliminary Aggregate Ranking System). Class C materials are only generally depicted, with no assigned geologic unit designation. Drawing 2 presents the 508 existing test data and field station sites within the study area.

Geologic symbols utilized in Drawing 1 relate to standard geological nomenclature whenever possible. Undifferentiated alluvial and rock units were established primarily to accommodate map scale and may contain deposits which could supply significant quantities of high quality materials. A conversion table to relate these geologic symbols to Fugro geologic unit nomenclature is contained in Appendix E.

All contacts which represent distinct boundaries between geologic material types (or classes of aggregate resources) are shown as solid lines in Drawing 1. The contacts are dashed where the depicted data were extrapolated beyond the limits of the source data or where accuracy of the data may be questionable. Local small deposits of one type or class of material may be found in close association with a larger deposit of a different type or class. Due to scale limitations, these smaller deposits could not be shown on the aggregate resources map and have been combined with the more prevalent material.

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Appendices contain tables summarizing the basic data collected during the field investigations, the results of Fugro National's supplemental aggregate testing program, existing test data gathered from various outside sources, an explanation of caliche development, the Unified Soil Classification System, photographs of typical material sources, and a geologic unit cross reference table.

2.2 PRELIMINARY AGGREGATE RANKING SYSTEM

After completing field activities and compiling all data, a system to preliminarily rank potential concrete aggregate sources was developed in order to describe their relative merits. Based primarily on physical properties, this ranking system divided the potential aggregate sources into Class A, Class B, and Class C (Table 2). Exposure characteristics of the potential aggregate source, such as extent, accessibility, minability, and water availability were also considered but generally did not alter the physical property ranking.

The specifications for each class of material are based on 1) ASTM C33-74A Standard Specifications for Concrete Aggregate, 2) SSPWC Part II Construction Sections 200-1.1, 1.4, 1.5, and 1.7, 3) a review of the literature applicable to concrete aggregates, 4) contacts with industrial producers of concrete aggregates, 5) contacts with consultants in the field of concrete aggregates, and 6) sound engineering and geologic judgment.

Since a majority of deposits being evaluated either lack test data completely or were previously tested for their suitability

AGGREGATE CHARACTERISTIC 1			AGGREGATE RANKING			
			CLASS A	CLASS B 2	CLASS C	
ABRASION F	ABRASION RESISTA総定,PERCENT WEAR ³		~40	40-50	>50	
	COARSE AGGREGATE		Na 504	< 12	~12	>12
SOUNDNESS,			Mg SO4	< 18	<18	>18
PERCENT LOSS 4	FINE AGGREGATE		Na SO4	~ 10	<10	>10
			Mg 504	< 15	<15	> 15
	MATERIAL FINER THAN NO. 200 SIEVE		IGGREGATE	<1	1-2	> 2
			FINE AGGREGATE		3–7	>7
AGGREGATE, MICA Caliche or Clay	OTHER DELETERIOUS MATERIAL (ALKALI REACTIVE AGGREGATE, MICA, GYPSUM, PYRITE, CHLORITE, CALICHE OR CLAY COATINGS, LOW DENSITY OR ORGANIC MATERIAL, FLAT, PLATY, OR ELONGATE PARTICLES)		~ 1	1–3	>3	

- 1. AGGREGATE CHARACTERISTIC BASED ON ESTIMATED VALUES OR STANDARD TEST RESULTS
- 2. THIS CLASS MAY BE DIVIDED INTO SUBUNITS ${\tt B_1}$ (ONE OR TWO POOR CHARACTERISTICS) OR ${\tt B_2}$ (More than two characteristics)
- 3. ASTM C131 (500 REVOLUTIONS)
- 4. ASTM C88 (5 CYCLES)

PRELIMINARY AGGREGATE RANKING SYSTEM UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMG

TABLE 2

UGRO NATIONAL, INC.

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for some other purpose, this preliminary ranking system relies heavily on qualitative evaluations based upon field visual observations. The general physical property characteristics of Class A, Class B, and Class C aggregate sources are as follows:

Class A

Potential sources of high quality concrete aggregate not requiring the use of special cements or admixtures (Table 2). Only minimal processing should be necessary to meet known requirements for concrete aggregate. However, additional testing and case history studies will be needed to confirm adequacy and define exact characteristics.

Class B

Potential source of possible concrete aggregate exhibiting one or more undesirable characteristics which make it of poorer quality than Class A aggregate (Table 2). Detailed investigations will be required to accurately determine aggregate suitability and probable concrete characteristics. Where possible, this class of material was divided into subunits B₁ and B₂. Materials classified as B₁ are considered to be generally adequate for concrete aggregate having only one or two characteristics which cause them to be ranked as Class B material. Those materials ranked as B₂ are considered to be probably suitable but have several characteristics which may make them marginal for use as concrete aggregate. Where these distinctions could not be made with present information, the material is classified as Class B.

Class C

Material considered unsuitable for use as concrete aggregate (Table 2).

3.0 STUDY RESULTS

3.1 LOCATION AND DESCRIPTION OF STUDY AREA

The UARSA is located in western Utah and easternmost Nevada (Figure 2). It includes portions of Tooele, Juab, Millard, Beaver, Iron, and Washington counties, Utah, and Elko, White Pine, and Lincoln counties, Nevada. With a maximum north-south length of approximately 200 miles and a maximum east-west width of 125 miles, the study area encompasses almost 16,000 square miles.

The study area lies totally within the Basin and Range Physiographic Province. The physiography is controlled by, and strongly reflects, the underlying geologic structure. remnants of uplifted fault-block mountains separated by downdropped basins characterize the study area. Mountain ranges are commonly composed of Paleozoic carbonate and clastic rocks that exhibit north to northwest trends. Quaternary basalt flows and associated cinder cones are common in the southeastern portion of the study area. Many of the valleys are broad and elongated and have been inundated by various Pleistocene lakes (e.g., Lake Bonneville) that have greatly influenced the Quaternary depositional history. Closed basin conditions are common today, with gently sloping alluvial surfaces grading toward playas in the valley axes. The Sevier Dry Lake is a large closed system that forms the terminus of the area's only major drainage system, the Sevier River.

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3.2 POTENTIAL AGGREGATE RESOURCES

3.2.1 Basin-Fill Sources

The principal basin-fill sources of potentially acceptable aggregate within the UARSA are older lacustrine, alluvial fan, stream channel, and undifferentiated alluvial deposits. All exhibit a range in quality, depending primarily upon durability and gradation characteristics. Ideally, a basin-fill concrete aggregate source should be composed of well-graded, hard, durable, subangular to subrounded particles. Railroad ballast durability specifications are similar to concrete aggregate, but typical grain size varies from 1-3/4 to 1-1/2 inch, preferably crushed material. Road subbase material requirements are much less stringent than concrete aggregate requirements. Therefore, all concrete aggregate sources should be acceptable for road material.

Although the gradation may be altered extensively by processing, economics demand that the source material be within certain defined gradation limits. In addition, concrete design specifications may require excessive plus 3/4-inch material to produce 3/8-inch crushed gravel. The gradation of the aggregates in a concrete mix affects not only strength, cement and water content, and workability but also concrete pumping requirements and reinforcing rod spacing. Basin-fill aggregate gradation sizes have been grouped into two general categories for this study: minus 3/8-inch fine aggregate (fine to coarse

sand), and plus 3/8-inch coarse aggregate (fine gravel to boulders).

The large areas of basin-fill material designated as Class C in Drawing 1 represent primarily fine-grained deposits deemed unsuitable for aggregate. Most Class C material is deep water older lacustrine, playa, or fine-grained distal alluvial fan material. Small units of higher class basin-fill material occur within the Class C areas but were not depictable in Drawing 1.

3.2.1.1 Older Lacustrine Deposits - Aol

Older lacustrine deposits within the UARSA were deposited in Pleistocene Lake Bonneville and related lakes. Lake Bonneville originally covered vast portions of western and northern Utah but has since receded to become the present Great Salt Lake.

Paleo-nearshore sand bar, sand spit, and delta deposits form major potential fine and coarse aggregate sources. These deposits occur in zones roughly coincident with the paleo-shorelines at the 4800- and 5200-foot topographic contours and are predominantly composed of sand and gravel with lesser amounts of cobbles and boulders. A range of gradations may be present depending on the environment of deposition but generally the selective sorting of sediments by wave action has removed most silt- and clay-sized material. Extensive older lacustrine sediments, deposited in deeper water environments, may be present in the central portions of many of the valleys. However,

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these contain significant amounts of silt, clay, and alkaline salts or other evaporites and are not considered potential aggregate sources.

The most common deleterious material noted is chert, but it was never observed in excess of five percent by volume. Other deleterious materials noted in these units include potentially alkali reactive, vesicular, or low density volcanic, metamorphic, and sedimentary particles. Test results and field station data indicate that some deposits may be deficient in the plus 3/4-inch size, with an average 78 percent passing the 3/4-inch sieve and a range of 70 to 85 percent.

Locally extensive and widely distributed older lacustrine deposits are generally ranked as Class A or Class B_1 , depending on deleterious material content and gradation restrictions. These deposits are presently being widely utilized as sources of fine and coarse aggregates for highway construction in Utah.

Although older lacustrine deposits are locally extensive, they were usually not depictable at the 1:500,000 scale of Drawing 1. They have been grouped with the alluvial fan (Section 3.2.1.2) and undifferentiated alluvium (Section 3.2.1.4) deposits in most instances.

3.2.1.2 Alluvial Fan Deposits - Aaf

Alluvial fans flanking the mountain fronts are widespread throughout the UARSA and provide one of the most extensive reserves of coarse and fine aggregates in the study area. They are formed by the erosion of material from surrounding rock or areas of higher relief. The material is gradually transported downslope under the influence of gravity and water and is deposited in characteristically fan-shaped geomorphic features.

The deposits are typically heterogeneous to poorly stratified mixtures of boulders, cobbles, gravel, sand, silt, and clay that grade from very coarse grained near the rock/alluvium contact to fine grained near the valley interiors. Individual fan units contain poorly to well graded, subangular particles that exhibit great lateral and vertical textural variation. Test data indicate that most of the alluvial fan deposits may be deficient in the plus 3/4-inch sizes. The average percent passing the 3/4-inch sieve was 73 percent and ranged from 65 to 86 percent.

Composition of the surrounding source rock strongly controls the quality of the material found in alluvial fans. Fans surrounding carbonate or quartzitic rocks generally contain the most durable and sound materials, while those surrounding undifferentiated volcanic, metamorphic, and sedimentary rocks are generally less acceptable.

Caliche development, a natural process of soil development in arid climates, ranged from none in the younger fans to Stage IV (Appendix B) in the older fans. The older, more calichified units may be partly or wholly consolidated, contain excessive deleterious carbonate or clay coatings and highly weathered clasts, and be unacceptable for use as aggregate.

Alluvial fan deposits are widespread and extensive and are being actively mined for localized fine and coarse aggregates in the study area. However, because of the restricted particle gradations, content of clay- or silt-sized material, and other deleterious substance, a majority are ranked as Class B.

3.2.1.3 Stream Channel Deposits - Aal

Stream channel deposits associated with secondary ephemeral streams commonly transect alluvial deposits and trend perpendicular to the nearby mountain ranges toward the valley axes. There, they terminate at a central playa area or a primary drainage system. Most are too small to depict in Drawing 1 and have been grouped with the adjacent, more predominant units (i.e., alluvial fan, undifferentiated alluvium).

Stream channel deposits vary from heterogeneous mixtures of sand, gravel, cobbles, and boulders near mountain fronts to fine-grained sands, silts, and clays near valley centers. The quality of the material reflects the properties of the rock types found in the stream source area and along its course and the deposits have been ranked accordingly. The most durable and sound materials are found along streams which drain areas of carbonate or quartzitic rock terrain. The deposits along streams draining volcanic and metamorphic source areas are highly variable and may or may not contain acceptable materials. Near mountain fronts where stream gradients are high, stream channel deposits are generally coarse grained, noncemented, free of deleterious coatings, suitably shaped, contain a low

percentage of silt and clay fines, and are relatively durable. The soft and friable materials have largely been removed by the natural abrasive action of stream transport. Further from the mountain fronts suitable fine aggregate sources of sand may be located. Material deposited by streams near valley centers or on the flood-plains of major drainages is generally too fine-grained to make acceptable aggregate. Many stream channel deposits are self-renewing with a fresh supply of sand and gravel being carried downstream during periodic cloudbursts.

A majority of the stream channel deposits have been ranked as Class B. Because of their limited areal extent, they will supply only localized aggregate requirements and are not considered potential major fine or coarse aggregate sources.

3.2.1.4 Alluvial Deposits Undifferentiated - Au

Undifferentiated alluvial deposits consist of various combinations of basin-fill units that could not be separately delineated in Drawing 1 because of the map scale. Included are alluvial fans, older lacustrine, playa, stream channel, stream terrace, and pediment deposits. These alluvial deposits are heterogeneous to stratified mixtures of boulders, cobbles, gravel, sand, silt, and clay comprised of a wide range of rock types and deleterious substances. The composition and quality of the undifferentiated alluvia' unit voies according to the characteristics of the individual peposits.

Commercial production of fine and coarse aggregates from this composite unit was noted in Utah and Nevada. The undifferentiated alluvial deposits generally are ranked as Class B material and will require more detailed studies to delineate areas of higher quality.

3.2.2 Rock Sources

Potential sources of acceptable crushed rock within the UARSA include quartzite, limestone, dolomite, undifferentiated carbonate rocks, basalt, granitic rocks, and undifferentiated sedimentary, volcanic, and metamorphic rocks. Each exhibits a range of characteristics that are important to their use as potential aggregate sources.

Ideally, a source rock for concrete aggregate should be easily accessible with favorable bedding and joint patterns and chemical and physical characteristics that, upon mining and soushier, breaks down into optimum-sized, equidimensional particles. Physical and chemical properties for railroad ballast and road base are similar but less exhaustive than those for concrete aggregate. Therefore, with the exception of particle sizes, any source considered acceptable for concrete aggregate will generally exceed requirements for railroad ballast and road base.

3.2.2.1 Quartzite - Qtz

Extensive deposits of Lower Paleozoic and Precambrian quartzites which occur throughout the UARSA are capable of producing large quantities of hard, durable, nonalkali reactive crushed rock

for use as aggregate (Drawing 1). Both metamorphic and sedimentary quartzites are present within the UARSA and possess similar aggregate characteristics. They are typically light colored, thin-to-medium bedded, hard to very hard rocks that are composed of 90 to 100 percent quartz grains. Geologic formations comprising the best quality potential quartzite aggregate include Prospect Mountain Quartzite (Class A), Eureka and Swan Peak quartzite (Class A), and Tintic Quartzite (Class A).

The quartzite formations in the UARSA are usually interbedded with shale, sandstone, and siltstone beds. In these locations this unit is generally ranked as Class B. Where the quartzite is extensive, accessible, and the dominant constituent of the mapped unit, it is ranked as Class A.

One existing quartzite rock quarry source located approximately 30 miles northeast of Delta, Utah, was noted during the field study, but it was not field-checked because of restricted access. It appears to be situated in Tintic Quartzite, a unit ranked as Class A elsewhere within the UARSA.

3.2.2.2 Limestone - Ls

Limestone is a carbonate rock widespread throughout the UARSA (Drawing 1). This hard, durable, medium to massively bedded cliff former is a potential source of high quality, non-alkali reactive crushed rock. The limestones are typically medium-to-dark gray, fine-to-medium grained, fossiliferous, and sparsely cherty with well developed bedding and jointing.

Principal geologic formations comprising the best limestone units include Ely Limestone, Great Blue Limestone, and the Marjum Limestone (Class A and/or Class B_1). These formations may also represent potential sources of cement; however, further work will be required to identify actual sites. Several limestone formations within the UARSA contain nodules or interbeds of chert as well as interbeds of shale and siltstone and thus are ranked as lower quality potential aggregate sources (Class B).

Two existing limestone rock quarries were noted during the field reconnaissances. One abandoned or inactive limestone quarry is located on the eastern flank of the Cricket Mountains in the central portion of the UARSA. Another abandoned or inactive limestone quarry is located approximately six miles north of the Tintic Mountains in the northern portion of the UARSA.

3.2.2.3 Dolomite - Do

Dolomite is a high magnesium carbonate rock that is located throughout the UARSA (Drawing 1) and is a potential source of good quality crushed rock. This rock is characteristically dark-to-medium gray, medium grained, moderately cherty with well developed bedding and jointing. Aggregate/portland cement potential alkali reactivity is suspected because of the rock texture and composition and the generally high chert content.

Principal formations comprising the bulk of this unit include the Simonson Dolomite and Notch Peak Dolomite (Class B_1). Dolomite, while present throughout the UARSA, is less voluminous

than the limestone (section 3.2.2.2). Most dolomite formations within the UARSA are Class B_1 , or Class B containing nodules or interbeds of chert as well as interbeds of shale, siltstone, sandstone, and cherty limestone.

3.2.2.4 Carbonate Rocks Undifferentiated - Cau

Materials classified as undifferentiated carbonate rocks include thick, complex sequences of limestones and dolomites interbedded with sandstone, shale, and siltstone (Drawing 1). Individual units were not delineated separately because of map scale limitations. Formations included within this unit are typically light-to-dark gray, thinly-to-massively bedded, hard, cherty, and fossiliferous. The undifferentiated carbonate rocks are generally ranked as Class B but range widely in quality, depending primarily upon their cher: content and the number of shale, siltstone, and sandstone interbeds. They are generally hard, durable cliff formers that compose many of the major topographic features in eastern Nevada and western Utah.

3.2.2.5 Basalt - Vb

Quaternary basalt within the UARSA is predominantly confined to a narrow zone in the southeastern portion of the study area. These large deposits generally lie in easily accessible midvalley localities as flows and associated cinder cones (Drawing 1). The basalt is typically a dense, dark gray to black, medium to thick bedded, locally vesicular, poorly jointed rock. Occasionally, interbeds of volcanic agglomerate and pumice are present.

Vesicular and locally scoriaceous (greater than 50 percent vesicles) upper portions and the suspected presence of potentially alkali reactive interstitial glass may make some basalts less desirable sources for concrete aggregate (Class B). However, these sources may provide more acceptable aggregate for railroad ballast and road base.

3.2.2.6 Granitic Rocks - Gr

Extensive exposures of granitic rocks (e.g., granite, monzonite) are located in the northwest portion of the UARSA (Drawing 1). They represent a potential source of nonreactive crushed rock, but their utilization is strongly dependent on the degree and depth to which they have been weathered.

These rocks are typically light colored, medium-to-coarse grained, siliceous-to-intermediate intrusions, with local gneissic or schistose structure developed near contacts and major structures. Where observed in outcrop, the majority of these granitic rocks were moderately weathered.

The degree of weathering observed at the surface and the uncertain depth to which the weathering extends below the surface required most granitic rocks within the UARSA to be ranked as Class B material.

3.2.2.7 <u>Sedimentary Rocks Undifferentiated - Su</u>

Sedimentary and metasedimentary rocks which are located throughout the UARSA in exposures too small to delineate at the map scale of 1:500,000 have been combined into an undifferentiated

sedimentary rock unit (Drawing 1). Rocks within this unit include interbedded sandstone, shale, dolomite, limestone, and quartzite that may have been slightly metamorphosed in some areas.

Locally, the limestone, dolomite, and quartzite may represent potential high quality aggregate sources, but due to the extreme variability of the material types, the content of potentially alkali reactive material, and the extent of metamorphism and structural disturbance, undifferentiated sedimentary rocks have generally been ranked as Class B₂ or Class B materials.

3.2.2.8 Volcanic Rocks Undifferentiated - Vu

Throughout the UARSA, exposures of intermediate to silicic igneous rocks that occur as flows, dikes, intrusions, and pyroclastic debris have been combined into an undifferentiated volcanic rock unit (Drawing 1). Individual rock types have not been delineated because of map scale limitations and similarities in composition. This composite unit has generally been ranked as Class B₂ material due to its lack of durability, suspected content of alkalai reactive glass, and low density material. Locally better quality material, not delineated on Drawing 1, may be found within this unit.

3.2.2.9 Metamorphic Rocks Undifferentiated - Mu

Undifferentiated metamorphic rocks that crop out in the northern portion of the UARSA generally include gneiss, schist, and quartzite that could not be separately delineated because of map scale limitations (Drawing 1). The extent to which the gneiss

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and schist can be utilized as a source of aggregate is strongly dependent upon the depth of weathering and the degree to which they have been weakened by foliation (mineral segregation and orientation). These rocks commonly yield platy and/or elongate particles that contain similarily weak foliation zones. Where foliation is poorly developed or widely spaced, fresh material from these units may produce acceptable crushed rock. Quartzite is typically of higher quality wherever it occurs.

Overall, the undifferentiated metamorphic rocks have been generally ranked as Class B. Locally, higher quality material exists within this unit.

4.0 CONCLUSIONS

Sufficient volumes of material to satisfy the aggregate requirements of the MX system appear to be available from a variety of basin-fill and/or rock sources within the UARSA. The most extensive and highest quality (Class A and Class B_1) potential basin-fill aggregate resources are present in the central and northern portion of the study area where both older lacustrine and alluvial fan deposits are abundant. However, the gradation of the sands and gravels in these deposits may be a limiting factor to the processing of the material for high-strength concrete and railroad ballast. Preliminary indications are that plus 3/4-inch particle sizes are generally lacking (i.e., less than ten percent).

Potential rock sources that will probably yield high quality processed aggregate are widely distributed throughout the study area. Most mountain ranges that border the basin areas are comprised wholly or in part of Paleozoic and Precambrian carbonate and quartzitic rocks with scattered Quaternary basaltic rocks located in valley areas. Quartzitic rocks are typically of higher quality (Class A) than limestone and dolomite carbonate rocks (Class Bland Class B) but are areally more limited. Basaltic outcrops are restricted to the southeastern portion of the study area and are less desirable (Class B) sources for concrete aggregate than either carbonate or quartzitic rocks. Nevertheless, they will probably provide moderate to good aggregates for road base and railroad ballast.

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High quality rock sources are generally more readily available than high quality basin-fill sources. However, because of the higher cost of developing aggregate from rock sources, it generally will be more economical to develop available basin-fill sources. Locally it will probably be necessary to supplement basin-fill aggregates with crushed rock aggregates where high-strength concrete or 1-3/4 inch to 1-1/2 inch size railroad ballast material is required, or to augment the necessary quantities of maximum size concrete coarse aggregate.

Adequate supplies of surface water for aggregate treatment are only locally available within the UARSA. Ground-water supplies stored in basin-fill and rock aquifers are expected to supply the water for aggregate plant operations. Studies being conducted for the water resources program will provide the information needed to determine the water supply system for construction operations.

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APPENDIX A

UTAH-NEVADA STUDY AREA DATA SHEETS

EXPLANATION OF FIELD STATION AND SUPPLEMENTARY

TEST DATA

Field station were established at locations throughout the UARSA where detailed descriptions of potential basin-fill or rock aggregate sources were recorded (Drawing 2). All field observations and laboratory test data on samples collected at selected stations are presented in Table A-1. Data entries record conditions at specific field station locations that have been generalized in the text and Drawing 1. Detailed explanations for the column headings in Table A-1 are as follows:

Column Heading	Explanation
Map Number	This sequentially arranged numbering system was established to facilitate the labelling of field station locations and existing data sites on Drawing 2 and to list the correlating information on Tables A-1 and A-2 in an orderly arrangement.
Field Station	Field stations were numbered sequentially during field reconnaissances. UGS or NGS are abbreviations denoting Utah or Nevada General Study field stations, respectively. Letters A and B, which preced the station number, differentiate the two investigative teams.
Location	Lists major physiographic or cultural feature in/or near which field stations or existing data sites are situated.
Geologic Unit	Generalized basin-fill or rock geologic units at field station or existing data locations. Thirteen classifications, emphasizing age and lithologic distinctions were developed from existing geologic maps to accomodate map scale of Drawing 1.
Material Description	Except in cases where soil or rock samples were classified on laboratory results, the descriptions are based on field visual observations utilizing the Unified Soil

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Column Heading

Explanation

Material Description (cont.)

Classification System (See Appendix C for detailed USCS information).

Field Observations

Boulders and/or	The estimated percentage of boulders and cobbles is based on an appraisal of the en-
Cobbles, Percent	tire deposit. Cobbles have an average dia- meter between 3 and 12 inches (8 and 30 cm);
. 01 000	boulders have an average diameter of

12 inches (30 cm) or more.

Gravel Particles that will pass a 3-inch (76 mm) and are retained on No. 4 (4.75 mm) sieve.

Sand Particles passing No. 4 sieve and retained on No. 200 (0.075 mm) sieve.

Fines Silt or clay, soil particles passing No. 200.

Plasticity Plasticity index is the range of water (Index) content, expressed as percentage of the weight of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Field classification followed standard descriptions and their ranges are as follows:

> None ~ Nonplastic (NP) (PI, 0 - 4)(PI, 4 - 15)(PI, 15 - 30)Low - Slightly plastic Medium - Medium plastic High - Highly plastic (PI,

Hardness A field test to identify materials that are soft or poorly bonded by estimating their resistance to impact with a rock hammer; classified as either soft, moderately hard, hard, or very hard.

Weathering Changes in color, texture, strength, chemical composition or other properties of rock outcrops or rock particles due to the action of weather; field classified as either fresh or slight(ly) moderate(ly) or very weathered.

Deleterious Substances potentially detrimental to con-Materials crete performance that may be present in aggregate; includes organic impurities, low density material, (ash, vesicules,

Column Heading

Explanation

Deleterious Material (cont.)

pumice, cinders), amorphous silica (opal, chert, chalcedony), volcanic glass, caliche coatings, clay coatings, mica, gypsum, pyrite, chlorite, and friable materials, also, aggregate that may react chemically or be affected chemically by other external influences.

Laboratory Test Data

Sieve Analysis (ASTM C 136) The determination of the proportions of particles lying within certain size ranges in granular material by separation on sieves of different size openings; 3-inch, 1 1/2-inch, 3/4-inch, 3/8-inch, No. 4, No. 8, No. 16, No. 30, No. 50, No. 100 and No. 200.

Abrasion Test (ASTM C 131)

A method for testing abrasion resistance of an aggregate by placing a specified amount in a steel drum (the Los Angeles testing machine), rotating it 500 times, and determing the material worn away.

Soundness Test (ASTM C 88) CA, FA CA = Coarse Aggregate FA = Fine Agregate

The testing of aggregates to determine their resistance to disintegration by saturated solutions of magnesium sulfate. It furnishes information helpful in judging the soundness of aggregates subject to weathering action, particularly when adequate information is not available from service records of the material exposed to actual weathering conditions.

Ranking

Potential basin-fill and rock aggregate sources were ranked as Class A, Class B (subdivided into B₁ and B₂ whenever possible), and Class C (See text, Section 2.2 for detailed discussion). Although the assigned ranking will generally directly reflect the results presented in Table A-1, its determination is the product of a total assessment of many factors, all of which are not presented.

Both fine and coarse basin-fill aggregate sources were evaluated and ranked. The ranking of deposits which are potential fine and/or coarse aggregate sources was made on the predominant size range.

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL Description	USCS Symbol	BOULDERS AND/OR COBBLES PERCENT	150
MAP	STATION		UNIT	DESCRIPTION	SIMBUL	BOULDER AND/OR PERCENT	GRAVEL
1	UGS-A1	Skull Valley	Aol	Sandy Gravel	GW		
2	UGS-A2	Skull Valley	Aol	Sandy Gravel	GP	10	75
3	UGS-A3	Skull Valley	Ls	Limestone			
4	UGS-A4	Dugway Valley	Cau	Dolomite			
5	UGS-A5	Dugway Valley	Vu	Latite		;	
6	UGS-A6	Dugway Valley	Aol	Sandy Gravel	GP		85
7	UGS-A7	Sevier Desert	Vb	Basalt			
8	UGS-A8	Tule Valley	Aol	Sandy Gravel	GW		
9	UGS-A9	Tule Valley	Aol	Sandy Gravel	GW		
10	UGS-A10	Sevier Desert	Vb	Basalt			
11	UGS-All	Sevier River	Au	Silty Clay	CL	0	0
12	UGS-A12	Pavant Valley	٧b	Basalt			
13	UGS-A13	Pavant Range	Qtz	Quartzite			
14	UGS-A14	Holden	Aol	Silty Sand	SP-SM	0	25

			F	IELD 0	BSERVATI	ONS							LABO	RATORY	TEST	DATA	
	TI	TRIBUTI ERIAL IAN COM PERCEI	FINER Bles,	PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS		S	IEVE A	NALYSI	S, PER	CENT P	ASSING	(ASTM	C 136)
Transfer	GRAVEL	SAND	FINES	PL AST	HARD	WEATH	MATERIALS	3*	14"	3/4"	3/8**	NO.	NO. 8	NO. 16	NO. 30	NO. 50	25
	75	20	5	Low None			<pre><5% chert, caliche coatings <5% chert, caliche</pre>	100	93.2	72.8	45.8	31.5	29.5	27.9	25.2	21.8	15.
A CONTRACTOR OF THE PROPERTY O					Hard Hard	Slight Slight	coatings <5% chert iron oxide,										
		i 			Hard	Moderate	calcite veins 5% volcanic glass										
3.000	85	15	T	None	Very	Slight	10% volcanic glass, clay coatings										
and the second second				None	Hard	Silght	<pre><10\$ vesi- cles caliche coatings</pre>	100	99.0	85.1	44.1	13.4	6.8	4.2	3.7	3.5	2
				None			caliche coatings	100	97.1	79.4	48.7	17.4	7.2	3.7	2.7	2.2	1
	0	5	95	High	Very Hard	Moderate	10% vesi- cles clay	i i) } }					
					Very Hard	Fresh	<10% vesi- cles									<u>.</u> E	
	25	65	10	Low	Very Hard	Fresh	none 5% chert, caliche										
							caliche coatings										

<u> </u>									
	TEST C	ATA							
G	(ASTM	C 136)		ABRASION Test (asta c 131)	SOURONESS	(ASTE C 88)	RANKING	
	NO. 30	NO. 50	NO. 100	NO. 200	PERCENT WEAR	PERCEN'	LOSS		
Ц	30	50	100	200	WEAR	CA	FA		
<u></u>	25.2	21.8	15.1	3.1	22.3	2.15		B	
								В	
								B ₁	
								B ₁	
								В	
								В	
					19.6	1.01	,	Bl	
.2	3.7	3.5	2.4	0.5	22.2	0.73		В	
.7	2.7	2.2	1.7	1.1	26.1	1.75		В	
		<u> </u>	}		25.8	2.60		В	
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								В	
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FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 1 OF 14 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - 840 TABLE A-1

TURRO NATIONAL INC.

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	USCS	LOERS /OR COBBLES CENT	MAT	RIBO ERIA AM CO PERC
MAP	STATION	UNIT DESCRIPTION		SYMBOL	BOULDERS AND/OR PERCENT	GRAVEL	S. AND	
15	UGS-A15	Black	Vb	Basalt				
כו	UGS-A 15	Rock	VD	Dasait	,			
16	UGS-A16	Sevier Desert	Aol	Sandy Gravel	GP	T	65	30
17	UGS-A17	Cricket Mountain	Cau	Limestone				
18	UGS-A18	Sevier Desert	Aol	Gravelly Sand	SM	0	15	70
19	UGS-A19	Oak City	Su	Conglomerate				
20	UGS-A20	Tule Valley	Cau	Dolomite				
21	UGS-A21	Tule Valley	Ls	Limestone				
22	UGS-A22	Tule Valley	Aol	Sandy Gravel	GP	0	80	20
23	UGS-A23	Tule Valley	Vu	Ash Flow				
24	UGS-A24	The Barn	Qtz	Quartzite				
25	UGS-A25	The Barn Pass	Do	Dolomite				
26	UGS-A26	The Barn	Do	Dolomite				
27	UGS-A27	Marjum Pass	Aol	Sandy Gravel	GP	Т	90	10
28	UGS-A28	Tule Valley	Ls	Limestone				
29	UGS-A29	Tule Valley	Aol	Sandy Gravel	GP	T	60	40

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				IELD O	BSERVATI	DNS							LABO	RATORY	TEST	DATA	
1		RIBUTII ERIAL F AN COBB PERCENT		PLASTICITY			DELETERIOUS		S	IEVE A	NALYSI	S. PER	CENT P	ASSING	(ASTM	C 136)
PENCEN	GRAVEL	SAND	FINES	PLAS	HAR	WEAT	MATERIALS	3"	1½**	3/4**	3/8**	NO. 4	NO. 8	NO. 16	NO. 30	NO. 50	
					Very Hard	Moderate	none										
	65	30	5	None			caliche coatings						I				
					Very Hard	Fresh	5% chert, calcite veins					! !		<u> </u> 			
Ann and Advanced on the	15	70	15	Low			caliche coatings))	
					Mod. Hard	Moderate	15 % friable material								<u> </u>		
			}		Very Hard	Fresh	<5% chert										
dimension and the		·) 	Very Hard	Fresh	<5% chert									<u>.</u>	
	80	20	T	None			5% chert, caliche coatings										
					Very Hard	Fresh	10% volcanic glass & pumice				:				[] 		
					Very Hard	Fresh	none			,					i I		
					Very Hard	Fresh	5% chert										
					Very Hard	Fresh	none									1	
	90	10	0	None			10% mica schist particles		,								
	60	40	T	None	Mod.	Moderate	<5% chert <5% chert				:	i			}	ļ	
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					LABORATORY TEST DATA											
RANKING	TEST (ASTH C 88)	SOUNDNESS	ABRASION TEST (ASTH C 131)		MALYSIS, PERCENT PASSING (ASTM C 136)											
22	NT LOSS	PERCEN	PERCENT WEAR	NO. 200	NO. 100	NO. 50	ND. 30	NO.	NO.	NO.	3/8**					
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FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 2 OF 14 UTAH-MEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BWO

TABLE A-1

VORO NATIONAL INC.

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	USCS	S COBBLES	BIST MATI THI	Π
MAP	NOITATZ		UNIT	DESCRIPTION	SYMBOL	BOULDERS AND/OR COBBLES, PERCENT	GRAVEL	
30	UGS-A30	Sand Pass	Ĺs	Limestone				
31	UGS-A31	Fish Spring Flat	Ls	Dolomite				
32	UGS-A32	Fish Springs Valley	Aol	Gravelly Sand	SP	0	20	80
33	UGS-A33	Antelope Ridge	Vu	Rhyolite				
34	UGS-A34	Crate Bench Reservoir	Aol	Gravelly Sand	SP	0	20	8 d
35	UGS-A35	Pine Wash	Gr	Granite				
36	UGS-A36	Pine Wash	Gr	Granite	<u> </u>			
37	UGS-A37	Desert Mountain	Gr	Granite				
28	UGS-A38	Black Mountain	Aol	Silty Gravel	GM	5	60	20
39	UGS-A39	Sevier River	Au	Gravelly Sand	SP	0	20	80
40	UGS-A40	Cove Creek Pass	٧b	Basalt				
41	UGS-A41	Mineral Mountains	Vb	Basalt				
42	UGS-A42	Black Rock	Aol	Gravelly Sand	SP-SM	0	15	75

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		F	IFID O	BSERVATI	2NO							LADO	DATABY	TECT	DATA		
	TRIBUT TERIAL MAN COI	ION OF FINER	T		1				LEVE A	MA4 MA*			RATORY				
-	PERCE	<u> </u>	PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS MATERIALS	SIEVE AN		SIEVE ANALYSIS, PERCENT PASSING (ASTM C 136)								
GRAVEL	SAND	FINES	PLAS	HAR	WEAT	MATERIALS	3**	1½**	3/4**	3/8**	NO.	NO.	NO. 16	NO. 30	NO. 50	N8 100	
				Hard	Slight	scattered calcite veins											
				Hard	Fresh	5 % chert			1								
20	80	0	None			50% volcanic glass particles		ı									
				Very Hard	Fresh	10% volcanic glass, zeolites											
20	80	0	None	ļ	,	5 \$ chert	i										
				Mod. Hard	Very	5% mica											
				Mod. Hard	Very	limonite, copper oxide											
				Mod. Hard	Moderate	5% mica	i							:			
6 0	20	20	Low			10% volcanic glass, clay coatings		 									
2 0	80	Т	None		,	10% volcanic particles											
				Very Hard	Fresh	5% volcanic glass					ı						
				Hard	Slight	scattered Volc. glass									Ì		
15	75	10	None			<pre><10\$ volcanic glass particles</pre>		·									

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į	RATORY	TEST C	ATA							}
	ASSING	(ASTM	C 136)		ABRASION Test Kastu C 1313	SOUNDMESS	(ASTE C 68)	RANKING	
	NO. 16	NO. 30	NO. 50	NO. 100	NO. 200	PERCENT WEAR	PERCENT	LOSS	_	
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FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 3 OF 14 UTAN-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - 980 TABLE A-1

VERO NATIONAL ING.

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	NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	USCS	S 1880 ES		
- 1	MAP	STATION		UNIT	DESCRIPTION	SYMBOL	BOULDERS And/or Cobbles, Percent	GRAVEL	
Γ									
	43	UGS-A43	Beaver River	Aol	Gravelly Sand	SP	0	10	90
	44	UGS-A44	Big Wash	Au	Gravelly Sand	SP	0	15	85
	45	UGS-A45	Wah Wah Valley	Aol	Sandy Gravel	GW			
	46	UGS-A46	Star Range	Gr	Granite				
1	47	UGS-A47	Hamlin Valley	Do	Limestone				
1	48	UGS-A48	Wah Wah Summit	Cau	Limestone				
	49	UGS-A49	Warm Love Ridge	Aaf	Sandy Gravel	GP	Т	50	45
1	50	UGS-A50	Pine Valley	Aal	Sandy Gravel	GP	T	70	30
!	51	UGS-A51	Ferguson Desert	Do	Dolomite	ļ			
	52	UGS-A52	Crystal Peak	Vu	Ash Flow				
!	53	UGS-A53	Crystal Peak	Aaf	Sandy Gravel	GP	5	50	50
	54	UGS-A54	Grassey Cove	Ls	Limestone				
1	55	UGS-A55	Pine Valley	Vu	Latite Ignimbrite				
	j								
			1						

			IELD O	BSERVATI	ONS							LABO	RATORY	TEST	DATA	
	TRIBUT TERIAL HAN COE PERCEI	BLES. HT	PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS		S	IEVE A	NALYSI	S, PER	CENT P	ASSING	(ASTM	C 136)
BRAVEL	SAND	FINES	PL AS	HAR	WEAT	MATERIALS	3"	14"	3/4"	3/8**	NO.	NO.	NO. 16	NO. 30	NO. 50	NO. 100
9 0	90 85	0 T	None None			5% intermed. volcanic particles none										
				Very Hard Mod. Hard Very Hard	Fresh Moderate Slight	5% altered volcanic particles, 5% edpidote, zeolites 5% chert scattered calcite	100	87.0	70.2	54.1	42.1	33.0	26.0	20.2	6.6	2.1
	45	5	Low			veins 10% intermed. volcanic particles 5% chert	,	2								The second secon
	30	0	None	Hard Soft	ĺ	none 15 to 50% chert 75% volcanic glass and pumice										e de la companya de l
	50	T	None	Hard	Slight Moderate	20% intermed. volcanic, caliche coatings 5% chert 5% chal- cedony, volcanic glass										

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1	ATA							
TM	C 136)		ABRASION TEST Castu c 1313	(ASTM C 00)	RANKING		
	NO. 50	NO. 100	NO. 200		PERCEN CA	T LOSS FA	~	
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FIELD STATION AND SUPPLEMENTARY TEST BATA PAGE 4 OF 14 UTAH-NEVADA STUDY AREA

WE SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 800

TABLE A-1

TURED MATIONAL ING.

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NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	USCS	S Cobbles,	MAT!	RIBUT RIAL N COU PERCE
MAP	STATION		UNIT	DESCRIPTION	SYMBOL	BOULDERS AND/OR CO PERCENT	GRAVEL	SAND
56	UGS-A56	Pine Valley	Aal	Gravelly Sand	SP	0	15	85
57	UGS-A57	Pine Valley	Aaf	Gravelly Sand	SP	5	35	65
58	UGS-A58	Pine Valley	Au	Gravelly Sand	SP	0	T	95
59	UGS-A59	Pine Valley	Aaf	Sandy Gravel	GP	5	65	30
60	UGS-A60	Pine Valley	Qtz	Quartzite				
61	UGS-A61	Pine Valley	٧u	Rhyodacite				
62	UGS-A62	Pine Valley Ridge	Aaf	Gravelly Sand	SP	T	15	85
63	UGS-A63	Escalante Desert	Aal	Sandy Gravel	GP	10	60	40
64	UGS-A64	Blue Mountain	Vu	Tuff				
65	UGS-A65	Escalante Desert	Aal	Gravelly Sand	SP	5	45	55
66	UGS-A66	Escalante Desert	Vb	Volcanic Flow Breccia				
67	UGS-A67	Escalante Desert	Aaf	Sandy Gravel	GP	5	60	40
68	UGS-A68	Escalante Desert	Vu	Dacite				

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			FIELD (DBSERVATI	ONS		T					LAR	RATORY	TEST	DATA	
	HAN COL	FINER BBLES.	PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS			SIEVE /	MALYSI	S. PEI		PASSING			1)
GRAVEL	SAND	FINES	PL AST	HARD	WEATH	MATERIALS	3"	14"	3/4"	3/8"	NO. 4	NO.	NO. 16	NO. 30	NO. 50	NO. 100
5 F 5	85 65 95 30	0 T 5	None None None	Very Hard Soft	Fresh Very	>70% intermed volcanic particles and ash none 5% chalcedony none none 5% volcanic glass										
5	85 40	T	None None			>80% intermed volc. & low density particles <5% intermed. volcanic particles										
5	55	T	None	Mod. Hard		>70% volcanic glass 80% volcanic and low density particles						{ { 				
	40	T	None	Mod. Hard Mod. Hard		>50% low density materials >50% altered volc. & low density particles none										
				_ [Ĭ		ı	- 1				1]			

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RY	TEST	DATA							
16	(ASTM	C 136)		ABRASION TEST (ASTW C 131)	SOURDNESS	(ASTH C 88)	RANKING	
	NO. 30	NO. 50	NO. 100	NO. 200	PERCENT WEAR	PERCEN CA	T LOSS	~	
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FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 5 OF 14 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE A-1

UGRO NATIONAL ING

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	USCS	BOULDERS AND/OR COBBLES, PERCENT	DIST MAT TH	RIBUT ERIAL AN COM PERCE
MAP	STATION		UNIT	DESCRIPTION	SYMBOL	BOULDER AND/OR PERCENT	GRAVEL	SAND
69	UGS-A69	Escalante Desert	Aaf	Sandy Gravel	GP	T	50	45
70	UGS-A70	Escalante Desert	Vu	Rhyodacite				
71	UGS-A71	Iron Mountain	Tailings	Crushed Rock				
72	UGS-A72	Big Mountain	Su	Sandstone				
73	UGS-A73	Enterprise	Vb	Basalt	i 			
74	UGS-A74	Steptoe Valley	Su	Limestone				
75	UGS-A75	Spring Valley	Aaf	Gravelly Sand	SP-SM	T	30	60
76	UGS-A76	Spring Valley	Vu	Rhyolite			į	
77	UGS-A77	Shelbourne Pass	Ls	Limestone				
78	UGS-A78	Spring Valley	Aaf	Silty Gravelly Sand	SP-SM	T	15	75
79	UGS-A79	Spring Valley	Aaf	Gravelly Sand	SP	T	40	55
	,							
	L							

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	TAI SU		FIELD O	BSERVATI	ONS		<u></u>					LABO	RATORY	TEST	DATA	
-	STRIBUT ATERIAL MAN COS PERCEI	!	PL ASTIGITY	HARDNESS	WEATHERING	DELETERIOUS		S	IEVE A	NALYSI	S, PER	CENT P	ASSING	(ASTM	C 136)
TSKANS (SAND	FINE	P.L. AS	HARI	WEAT	MATERIALS	3"	1½**	3/4**	3/8	NO.	NO.	NO. 16	NO. 30	NO. 50	NO. 100
9	45	5	None			30\$ volcanic particles caliche coatings										
0	60	10	None	Mod. Hard Hard Soft Hard	Slight Slight	none Limonite Magnetite <10% fraiable materials 5% volcanic glass 5% vesicles 5% chert <50% volcanic glass, clay										
5 0	75 55	10 5	None Low	Mod. Hard Hard	Moderate Moderate	clay coatings 5% volcanic glass, zeolites iron stain, calcite veins caliche coatings, clay coatings 5% to 15% volcanic glass										

TIN C 136) SS SS SS SS SS SS SS
D. NO. NO. NO. PERCENT PERCENT LOSS CA FA B2 B2
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FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 8 OF 14 UTAN-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMD

TABLE A-1

VORO MATIONAL INC.

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	uscs	OBBLES,	DIST MATI	RIB ERIA AN C PERI
MAP	STATION		UNIT	DESCRIPTION	SYMBOL	BOULDERS AND/OR CO PERCENT	GRAVEL	97.0
181	UGS-B70	Spring Valley	Su	Limestone				İ
182	UGS-B71	Snake Valley	Cau	Limestone				{
183	NGS-B72	Spring Valley	Aaf	Gravelly Sand	SP-SM	15	40	5
184	NGS-B73	Spring Valley	Aaf	Gravelly Sand	SM	15	35	60
185	NGS-B74	Spring Valley	Aaf	Gravelly Sand	SM	5	40	6
186	NGS-B75	Schell Creek Range	Vu	Andesite				
187	NGS-B76	Schell Creek Range	Aaf	Sandy Gravel	GW	15	50	3
188	NGS-B77	Antelope Valley	Su	Dolomite				
189	NGS-B78	Antelope Spring	Aaf	Gravelly Sand	SW	10	40	5
190	NGS-B79	Spring Valley	Aaf	Gravelly Sand	SW	т	35	6
191	NGS-B80	Antelope Valley	Ls	Quartzite				
192	NGS-B81	Antelope Valley	Vu	Rhyodacite				
		ļ					: 1	
					1			

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			ELD OF	SERVATI	ONS							LABO	RATORY	TEST	DATA	
	TRIBUTION TERIAL FOR COBB		PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS		s	I EVE A	NALYSI	S, PER	CENT P	ASSING	(ASTM	C 136)
GRAVEL	SAND	FINES	PLAST	HARD	WEATH	MATERIALS	3"	1½"	3/4**	3/8**	NO. 4	NO. 8	NO. 16	NO. 30	NO. 50	
40 35 40 35 40 35	50 60 60 50 65	10 5 T T	Low None None None	Hard Hard Very Hard	Slight	none caliche coatings caliche coatings 10% chlorite schist particles 10% volcanic glass caliche coatings 20% chert caliche coatings caliche coatings none 10% volcanic glass & pumice particles		14**	3/4**	3/8°			16	30	50 50	
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EST	DATA							
ASTM	C 136)		ABRASION TEST (astr C 131)	(ASTM C 88)	RANKING		
NO. 30	NO. 50	NO. 100	NO. 200	PERCENT WEAR	PERCEN CA	T LOSS FA	œ	
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FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 14 OF 14 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO TABLE

UGRO MATIONAL INC.

EXPLANATION OF EXISTING DATA

Existing data pertaining to aggregates were extracted from the Utah State Department of Highways' Materials Inventory county reports. These reports are compilations of avaiable site data from existing files and records and are intended to accurately locate, investigate, and catalog materials needed for highway construction. Explanations for column headings which appear in Table A-2, that have not been previously discussed in Table A-1, are given below:

Column Heading	Explanation
Site Number	Utah State Department of Highways pit or site number. Locations correspond to map numbers listed on this table and placed on Drawing 2.
Material Description USCS Symbol	To maintain conformity within the study, the Utah State Department of Highways classification system (A.A.S.H.O.) was converted to the Unified Soil Classification System (USCS) utilizing the sieve analyses' size distribution and the plasticity indices.
Sieve Analysis	The size distribution of fine and coarse aggregate samples was determined by sieving. In some samples, particles greater than 1 inch in size (>1 inch) were crushed to 1 inch maximum size and remixed with the remaining sample before sieving. In these cases, data entries under 1 inch are 100 percent, preceded by before crushing percentages.
No. 8, No. 5	Samples tested before mid-1963 used No. 10 and No. 40 sieves, respectively. These entries are marked with asterisks.
Soundness Test	The testing of aggregates to determine their resistance to disintegration by saturated solutions of sodium sulfate. It furnishes information helpful in judging the soundness of aggregates subject to weathering action,

Column Heading

Explanation

Soundness Test (cont.)

particularly when adequate information is not available from service records of the material exposed to actual weathering conditions.

MAP NUMBER	SITE NUMBER	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213	23090 23091 23118 23119 23120 23121 23122 23123 23124 23125 23126 23127 23128 23129 23134 23135 23137 23138 23139 23140 23141	USDH Tooele Co. USDH Tooele Co.	Rush Valley Rush Valley Rush Valley Rush Valley Rush Valley Rush Valley Rush Valley Vernon Creek Rush Valley Rush Valley Rush Valley Rush Valley Skull Valley Salt-Lake Desert Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley Skull Valley	Aaf Aaf Au Aol Aol Aol Aol Aol Aol Aol	Gravelly Sand Sandy Gravel Sandy Gravel Silty Sandy Gravel Silty Sandy Gravel Sandy Gravel Gravelly Sand Clayey Gravel Clayey Gravel Clayey Gravel Sandy Gravel
215	23 143	USDH Tooele Co.	Great Salt Lake Desert	Aol	Sandy Gravel

				SII	EVE AN	IALYS	ıs			ABRASION TEST STM C 131)	SOUNDNESS	(88 ເ	PLASTICITY
	SAMBOF R262	BEFO CRUS PERC	HING.)		ERCEN			AFTER	SIZE		PERC	(AS	INDEX (ASTM D 423
		>3**	>1"	1**	½ **	NO.	00. 8	NO. 50	NO. 200	PERCENT WEAR	LOS	S FA	and B 424)
-													
				100	95	59	42	11	8.0	27.8	8.62	7.46	NP
	SP-SM	0	0	100	61	26	20	14	8.1	26.7	6.39	15.6	NP
	GP-GM	0	14	100	84	43	27	14	3.3	24.8	2.2	5.4	NP
	GP CM	0	12	100	63	27	24	20	14.4	22.7	2.14	2.42	NP
el	GM GM	0	9	100	70	42	31	21	14.1	25.2	1.20	4.03	1
1	GP-GM	0	25	100	54	32	24	15	6.8	27.6	2.16	17.1	NP
	SP-SM	}	13	100	92	65	45	14	8.1	20	5.60	13.5	NP
	GC	7	36	100	60	34	24	11	7.5	21.4	0.69	5.7	20
	GC	16	46	100	52	33	25	9	5.7	21.5	0.84	7.28	14
el	GC	4	37	100	53	31	23	8	4.2	20.6	0.58	3.78	13
	GP-GM	18	43	100	60	41	33	22	11.5	22.7	1.4	5.8	NP
	GC	3	24	100	72	49	36	14	5.2	23.8	2.77	8.23	7
el	GM	0	15	100	69	44	35	26	17.4	28.2	1.09	5.31	NP
	GP	0	19	100	57	21	12	4	1.2	18.3	1.34	7.89	NP
	GP	23	73	100	77	22	15	6	2.4	20.1	10.84	22.11	NP
	GP	0	21	100	85	43	24	4	0.9	19.7	1.61	8.69	NP
	GP	23	59	100	63	34	28	19	3.0	17.0	3.09	4.98	NP
	GP	4	23	100	1	43	36	22	4.2	i			NP
	GP	0	20	100	1	29	18	8	3.1	ì	1.55	7.22	NP
	GP	0	16	100	(42	22	4	1.8	ì	2.3	6.98	NP
	GP	4	14	100	1	36	18	5	2.0	1	0.49	7.80	NP
	GP	0	4	100	1	7	7	5	2.8	23.8	0.87		14
	GC	0	20	100	50	19	14	3	1.6	29.2	0.24	4.88	2

EXISTING TEST DATA
PAGE 1 OF 20
UTAH-NEVADA STUDY AREA

WX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 800

TABLE A-2

TURRO NATIONAL INC.

2

MAP NUMBER	SITE Number	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
216	23144	USDH Tooele Co.	Great Salt Lake Desert	Aol	Sandy Gravel
217	23145	USDH Tooele Co.	Great Salt Lake Desert	Aol	Gravelly Sand
218	23146	USDH Tooele Co.	Great Salt Lake Desert	Aaf	Gravelly Sand
219	23152	USDH Tooele Co.	Antelope Valley	Aol	Gravelly Sand
220	23153	USDH Tooele Co.	Antelope Valley	Aol	Sandy Gravel
221	23154	USDH Tooele Co.	Antelope Valley	Aol	Sandy Gravel
222	23156	USDH Tooele Co.	Antelope Valley	Aol	Gravelly Sand
223	23157	USDH Tooele Co.	Antelope Valley	Aol	Sandy Gravel
224	23160	USDH Tooele Co.	Antelope Valley	Aol	Sandy Gravel
225	23161	USDH Tooele Co.	Antelope Valley	Aol	Gravelly Sand
226	23162	USDH Tooele Co.	Great Salt Lake Desert	Aol	Gravelly Sand
227	12045	USDH Juab Co.	Leamington Canyon	Aol	Sandy Gravel
228	12046	USDH Juab Co.	N. Sevier Desert	Aol	Silty Gravelly Sam
229	12047	USDH Juab Co.	N. Sevier Desert	Aol	Sandy Gravel
230	12048	USDH Juab Co.	N. Sevier Desert	Aol	Silty Gravel Sand
231	12049	USDH Juab Co.	N. Sevier Desert	Aol	Sandy Gravel
232	12050	USDH Juab Co.	N. Sevier Desert	Aol	Silty Gravelly San

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				SI	EVE A	NALYS	18			ABRASION Test Stm C 131)	NESS	ເ 88 ລ	PLASTICITY
	SAMBOF A	BEF CRUS PERI	HING.	î .	PERCEI HING	NT PAS		AFTE!		ABRA TE (astr	SOUNDNESS	(AS	INDEX (ASTM D 423
		> 3**	>1"	1 **	½™	NO.	NO. 8	NO. 50	NO. 200	PERCENT WEAR	PERC LO CA	ENT SS FA	and D 424)
_											- CA	FA	
	GP	2	31	100	42	29	26	16	2.0	20.1	0.19	3.03	NP
	SP	0	1	100	91	52	37	6	1.9	23.1	2.1	8.7	NP
	SP	0	4	100	88	64	50	14	0.7	32.7	2.1	7.3	NP
	SP-SM	0	2	100	89	61	43	12	5.9	30.5		18.3	NP
	GP	0	7	100	75	41	30	10	3.1	28.2	0.96	5.81	NP
	GP-GM	0	17	100	83	47	30	11	6.7	25.8	0.42	6.91	NP
	SP	0	5	100	87	59	42	7	4.0	38.5		6.51	NP
	GP	0	23	100	57	29	21	11	5.0	24.3	0.72	3.63	NP
	GP	0	3	100	78	42	27	6	2.9	22.6	0.57	6.19	NP
	SP	2	13	100	79	57	38	9	1.7	26.7	0.80	5.95	NP
	GP-GM	c	7	100	79	49	25	8	6.6	21.0	2.89	9.29	NP
	GP		4.7	95.3	92.5	36.6	13.9	6.4	4.4	24.7			NP
d	SM	4.1	10.8	100		61.7		43.2		20.6			NP
	GP-GM			100		38.4	26.4	18.8	10.1	23.6			NP
	SM	0	3.2	100		61.4	46.4	35.6	18.1	24.0			NP
	GP-GM	0	10.9	100		51.5	24.5	14.8	5.9	18.6			NP
d	SP-SM	0	3.0	97.0		59.4	33.3	30.5	11.6				NP
		<u> </u>		<u></u>			l					<u> </u>	<u> </u>

EXISTING TEST DATA PAGE 2 OF 20 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 800

TABLE

TURRO NATIONAL INC

2

MAP NUMBER	SITE	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
233	12051	USDH Juab Co.	N. Sevier Desert	Aol	Sandy Gravel
234	12052	USDH Juab Co.	N. Sevier Desert	Aol	Sandy Gravel
235	12053	USDH Juab Co.	N. Sevier Desert	Aol	Clayey Sand
236	12054	USDH Juab Co.	N. Sevier Desert	Aaf	Silty Gravel
237	12061	USDH Juab Co.	Tintic Valley	Aol	Sandy Gravel
238	12062	USDH Juab Co.	N. Sevier Desert	Au	Clayey Gravelly Sand
239	12063	USDH Juab Co.	N. Sevier Desert	Au	Gravelly Sand
240	12064	USDH Juab Co.	N. Sevier Desert	Au	Silty Gravelly Sand
241	12065	USDH Juab Co.	N. Sevier Desert	Au	Gravelly Sand
242	12066	USDH Juab Co.	N. Sevier Desert	Aol	Gravelly Sand
243	12067	USDH Juab Co.	N. Sevier Desert	Aol	Gravelly Sand
244	12068	USDH Juab Co.	N. Sevier Desert	Aol	Gravelly Sand
245	14017	USDH Millard Co.	Scipio Pass	Aaf	Silty Sandy Gravel
246	14018	USDH Millard Co.	Scipio Pass	Au	Silty Sandy Gravel
247	14019	USDH Millard Co.	E. Sevier Desert	Aal	Sandy Gravel
248	14020	USDH Millard Co.	E. Sevier Desert	Au	Silty Gravel
249	14021	USDH Millard Co.	E. Sevier Desert	Au	Silty Sandy Gravel

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	USCS Symbol	CRUS	ORE HING, CENT	1	EVE A	NT PA	SSING	AFTE IMUM		ABRASION TEST (ASTM C 131)	S	(ASTM C 88)	PLASTICITY INDEX
,		>3**	>1"	1**	¥••	NO.	NO. 8	NO. 50	NO. 200	PERCENT WEAR	PER LO CA	CENT ISS I FA	(ASTM D 423 and 7 424)
	GM GP SC GM GP-GM GC-SC SP-SM SP-SM	14.0	13.4 25.7 19.1 6.8	95.8 100 100 100 100	69.2 85.8 74.8 83.8	37.3 64.4 54.2 37.2 55.5	56.2 45.3 45.3 41.5	39.6 6.7	26.3 4.0 25.3 16.3 8.6 8.3	28.9 20.5 27.6 29.2 27.9	2.16 17.0 4.26 12.9	3.28 19.6 6.68	NP 10 NP NP NP 8 3
	SP	1.0	5.5	100	85.4	64.2	46.7	10.2	4.2	26.1	9.03	15.3	NP
	SP	1.1	5.1	100	89.9	64.8	43. 5	7.2	3.6	26.1	3.16	6.05	NP
j	SP-SM	0	10.5	100	83.7	57.0	40.7	17.2	7.2	25.1	2.61	8.55	NP
	SP	0	10.6	100	83.2	61.6	32.5	5.4	2.3	26.2	2.93	9.95	NP
	GM		14.7	100	74.5				14.2	37.6			NP
	GM		<u> </u>	100				_	í	40.8			
	GP-GM							ایا	J	23.2			NP
	GM		14.2	100	77.1	52.8	39.4	27.8	18.4	34.2	16.3	15.3	NP
	GM	14.2	30.6			40.8	37.6	28.2	13.4			_	4

EXISTING TEST DATA
PAGE 3 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE A-2

UBRO NATIONAL INC

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MAP NUMBER	SITE	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
250	14022	USDH Millard Co.	E. Sevier Desert	Aol	Sandy Gravel
251 252	14024 14025	USDH Millard Co. USDH Millard	E. Sevier Desert E. Sevier	Aol	Sandy Gravel Gravelly Sand
253	14026	Co. USDH Millard Co.	Desert E. Sevier Desert	Aol	Sandy Gravel
254	14027	USDH Millard Co.	E. Sevier Desert	Aol	Sandy Gravel
255	14028	USDH Millard Co.	E. Sevier Desert	Aol	Gravelly Sand
256	14029	USDH Millard Co.	E. Sevier Desert	Aal	Sandy Gravel
257	14030	USDH Millard Co.	E. Sevier Desert	Aol	Silty Sandy Gravel
258	14031	USDH Millard Co.	E. Sevier Desert	Au	Gravelly Sand
259	14032	USDH Millard Co.	E. Sevier Desert	Aal	Gravelly Sand
260	14033	USDH Millard Co.	E. Sevier Desert	Aaf	Sandy Gravel
261	14034	USDH Millard Co.	E. Sevier Desert	Aol	Sandy Gravel
262	14035	USDH Millard Co.	E. Sevier Desert	Aol	Sandy Gravel
263	14036	USDH Millard Co.	E. Sevier Desert	Aol	Sandy Gravel
264	14037	USDH Millard Co.	E. Sevier Desert	Au	Gravelly Sand
265	14038	USDH Millard Co.	E. Sevier Desert	Au	Gravelly Sand

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I			\$	IEVE /	ANALY:	SIS			ABRASION TEST STR C 131	MESS		PLASTICITY
35 001	CRU	FORE Shing Icent		PERCE SHING	NT PA	SSING		R SIZE	ABRA TE (AST#	SOUNDNESS	ASTIN C	INDEX
	>3*	>1"	1 ~	¾ ••	NO 4	NO 8	NO 50	NO. 200	PERCENT WEAR	PER	CENT ISS FA	(ASTM D 423) and D 424)
GM	3.8	57.3	100		33.0	25.7	18.3	6.0		<u> </u> 		NP
G P	0	23.4	100		39.6	32.7	22.9	2.7	21.8			NP
SM	0	14.2	100		60.3	47.5	35.1	15.8	21.0	}		NP
-GM	0	13.8	100	65.5	34.1	21.6	15.5	5.7	25.8			NP
GM	0	22.1	100	79.1	46.7	27.4	20.5	5.1	20.9			NP
SP			100	97.3	71.3	33.2	16.6	2.9		,		NP
GM	15.9	39.9	100	62.8	42.0	* 35.6	16.5	8.4	29.0			NP
GM	0	26.7	100	76.5	51.5	41.6	* 31.7	14.2	26.1			NP
GP		4.2	100	88.5	33.7	18.0	10.2	2.4	50.0			
-GM	22.4	66.1	100		40.6	* 29.7	# 19.4	7.3	31.9			NP
-GM			100		45.6		12.2	7.5				NP
GP	7.7	39.7	100	59.0	37.0	27.0	7.7	4.4	28.8	4.93	5.99	NP
GP		46.2	100	48.1	23.5	16.9	9.1	2.3	28.8			NP
P	0	12.3	100	72.2	47.1	ا ۽ 37.7	14.2	4.7	21.9	0.99	4.09	NP
P		5.8	100	89.9	64.4	40.8	10.7	2.3	42.0			
P			100	93.4	75.2	57.8	20.4	1.7				
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EXISTING TEST DATA PAGE 4 OF 20 UTAH-MEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 800

TABLE A-2

VERO NATIONAL INC.

2

MAP NUMBER	SITE Number	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
266	14039	USDH Millard Co.	E. Sevier Desert	Aaf	Sandy Gravel
267	14040	USDH Millard Co.	E. Sevier Desert	Aol	Gravelly Sand
268	14041	USDH Millard Co.	E. Sevier Desert	Aol	Sandy Gravel
269	14042	USDH Millard Co.	White Sage Flats	Aol	Sandy Gravel
270	14043	USDH Millard Co.	White Sage Flats	Au	Sandy Gravel
271	14044	USDH Millard Co.	Dog Valley	Au	Silty Sandy Gravel
272	14045	USDH Millard Co.	Dog Valley	Aaf	
273	14046	USDH Millard Co.	Dog Valley	Au	Gravelly Sand
274	14047	USDH Millard Co.	S. Sevier Desert	Au	Silty Sand
275	14048	USDH Millard Co.	S. Sevier Desert	Au	Silty Gravelly Sand
276	14049	USDH Millard Co.	S. Sevier Desert	Aaf	Clayey Gravelly San
277	14050	USDH Millard Co.	S. Sevier Desert	Aaf	Silty Sandy Gravel
278	14051	USDH Millard Co.	Leamington Canyon	Au	Gravelly Sand
279	14052	USDH Millard Co.	Leamington Canyon	Au	Sandy Gravel
280	14053	USDH Millard Co.	Leamington Canyon	Au	Gravelly Sand
281	14054	USDH Millard Co.	Leamington Canyon	Au	Sandy Gravel

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and the second			SI	EVE A	NALYS	18			ABRASION TEST ISTM C 131)	SOUNDNESS	C 88)	PLASTICITY
USCS Symbol	BEF CRUS PERI	HING.			NT PAS TO 1°		AFTE IMUM		ABRA TE (ASTM			INDEX (ASTM D 423
	>3**	>1**	1*	3,000	NO.	NO. 8	NO. 50	NO. 200	PERCENT WEAR	PERC LO CA	ENT SS FA	and D 424)
GP-GM	8.4	24.8	100	74.2	44.1	32.5	13.5	5.4	23.5	7.19	13.69	NP
SP			100	89.3	53.8	43.1	21.2	3.5	20.5	1.31	3.60	NP
GP	0	0	100	89.8	16.4	12.9	8.9	4.2	26.1	5.08	8.57	NP
GM			100	80.6	53.1	42.0	25 . 4	14.1	34.2			3
GP-GM	18.5	39.9	100	60.5	40.0	32.3	12.3	4.5	27.5	7.24	7.24	NP
GM	2.6	23.9	100	78.4	50.4	41.5	22 . 5	13.2	38.0	13.0	15.5	1
 	,											
SP-SM	0	13.7	100	77.4	55.4	# 41.9	21.7	7.9	31.4			NP
SM	0	6.5	93.5		88.5	83.1	56.9	24.1				NP
GM-GC	2.9	35.5	100	64.6	42.2	34.2	27.4	17.5	26.6	7.5	3.4	6
sc	0	4.9	95.1		81.2	68.9	53.2	41.2				12
GM-GC	6.4	30	100	71.7	45.1	36.0	16.6	9.6	35.6	23.7	36.2	6
SP	}	8.8	100	89.6	63.1	46.5	15.6	1.6	23.8	10.3	26.2	NP
GP	0	2.4	100		47.4	33. 4	20.0	3.1	20.4	3.27	3.19	NP
SP	0	2.9	100		54.9	40.7	26.3	2.8	20.4			NP
GP-GM	0	6.7	100		47.8	37.7	26.6	7.8	19.6			NP
				1		1			1			

EXISTING TEST DATA
PAGE 5 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMG

TABLE A-2

UDRO NATIONAL INC.

MAP NUMBER	SITE Number	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL DESCRIPTION
282	14055	USDH Millard Co.	N. Sevier Desert	Au	Gravelly Sand
283	14056	USDH Millard Co.	Fool Creek	Aol	Sandy Gravel
284	14057	USDH Millard Co.	Fool Creek	Aol	Sandy Gravel
285	14058	USDH Millard Co.	Oak Creek Sinks	Aal	Sandy Gravel
286	14059	USDH Millard Co.	Oak City	Aaf	Sandy Gravel
287	14060	USDH Millard Co.	E. Sevier Desert	Au	Silt/Sand
288	14061	USDH Millard Co.	E. Sevier Desert	Aol	Sandy Gravel
289	10462	USDH Millard Co.	E. Sevier Desert	Au	Silty Sand
290	14063	USDH Millard Co.	Pavant Valley	Au	Coarse-to-Fine Sand
291	14064	USDH Millard Co.	Pavant Valley	Au	Fine Silty Sand
292	14065	USDH Millard Co.	Pavant Valley	Au	Sandy Gravel
293	14066	USDH Millard Co.	Pavant Valley	Au	Silty Sand
294	14067	USDH Millard Co.	Pavant Valley	Aol	Sandy Gravel
295	14068	USDH Millard Co.	Taylor Flat	Au	Sandy Gravel
296	14069	USDH Millard Co.	E. Sevier Desert	Au	Poorly graded Sand
297	14070	USDH Millard Co.	E. Sevier Desert	Au	Poorly graded Sand
298	14071	USDH Millard Co.	E. Sevier Desert	Au	Silty Sand
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			SI	EVE A	MALYS	318			ABRASION TEST (STM C 131)	INESS	(88)	PLASTICITY
AMBOT	CRUS	ORE HING, CENT		PERCE Shing	NT PAS TO 1°		AFTE IMUM		ABRA TE (ASTM	SO	(ASTIN C	INDEX (ASTM D 423
	>3**	>1"	1**	1/2**	NO.	ND. 8	NO. 50	NO. 200	PERCENT WEAR	PERI LO CA	CENT SS FA	and D 424)
SP-SM	0	4.1	100		56.8	36. 7	21.1	6.6	20.9			110
GP-GM			100	ĺ	1	26.6		6.6				NP NP
GP	18.0	39.2	100		29.4	# 17.1	9.7					NP
GP	26.9	53.4	46.6		23.9	# 17.4	• 9.4	4.6				NP
GP-GM	0	24.9	100		36.2	26.2	20.8	8.0	29.8			NP
SM-ML		0				100*	99*	51.				NP
GP	1.5	34.1	100	63.9	33.1	27.8	23.5	1.4	26.4			NP
BP-SM	0	0			ŀ	100*	79.5	6.5				NP
SP					100	99.8	72.6	2.2				NP
SP-SM SP-GM	6 2	22.0		-a 1:	}	100	96.0	j				NP
BP-SM	6.3	23.9	100	70.4	44.8 100		18.5 99.3	6.9				NP
IP-GM	15.5	49.8	100				99.3 # 18.0	9.4				NP 2
GP	0	3.9			l .		25.6		22.6			NP
P-SM					ſ	[99.8	ſ	-			NP
P-SM						100	90.6	5.8				
SP						100*	68.4	3.4				NP
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EXISTING TEST DATA
PAGE 6 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 8M0

TABLE A-2

VERO NATIONAL INC.

MAP NUMBER	SITE Number	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
299	14072	USDH Millard Co.	Central Sevier Desert	Au	Cravelly Sand
300	14073	USDH Millard Co.	Central Sevier Desert	Au	Gravelly Sand
301	14074	USDH Millard Cc.	Central Sevier Desert	Au	Sand with some Silt
302	14075	USDH Millard Co.	Central Sevier Desert	Au	Silty Gravelly Sand
303	14076	USDH Millard Co.	S. Sevier Desert	Aol	Sandy Gravel
304	14077	USDH Millard Co.	S. Sevier Desert	Aal	Sandy Gravel
305	14078	USDH Millard Co.	S. Sevier Desert	Aol	Sandy Gravel
306	14079	USDH Millard Co.	S. Sevier Desert	Aol	Sandy Gravel
307	14080	USDH Millard Co.	S. Sevier Desert	Aol	Clayey Gravel
308	14081	USDH Millard Co.	S. Sevier Desert	Aol	Sandy Gravel
309	14082	USDH Millard Co.	S. Sevier Desert	Aol	Gravelly Sand
310	14083	USDH Millard Co.	S. Sevier Desert	Aol	Sandy Gravel
311	14084	USDH Millard Co.	Beaver Bottoms	Aol	Silty Sand
312	14085	USDH Millard Co.	W. Sevier Desert	Aol	Sandy Gravel
313	14086	USDH Millard Co.	W. Sevier Desert	Aol	Silty Sand

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USCS Symbol	CRUS	ORE HING. CENT		EVE A	NT PA	SSING			ABRASION TEST (ASTM C 131)	SOUNDNESS		PLASTICITY INDEX (ASTM D 423
	>3**	>1*	1**	½ **	NO. 4	NO. 8	NO. 50	NO. 200	PERCINT WEAR	PERC LO: CA	ENT SS FA	and D 424)
SP-SM	0	0.6	100		77.5	6 7.2	* 54.2	9.6	17.5			
SP-SM			100		76.3	62.2	# 39 - 3	5.8	1714			NP
SP						100	84.3	4.7				NP
SP-SM			100		85.5	66.3	26.d	5.3			,	NP
GP-GM	1.6	21.4	100		47.0	39.3	21.1	5.1	33.8			NP
GP-GM	0	6.8	100		48.3	# 31.3	20. 6	11.1	26.1			NP
GP-GM	0	8.6	100	82.5	48.8	32. 7	21.4	11.2	25.0			NP
CP		8.1	100	70.8	33.8	23.8	19.3	4.4	26.0			NP
GC	0	3.6	100	86.3	50.5	* 28.2	21.1	13.6	23.0			10
GP-GM			100	76.5	39.3	# 30.9	21.9	6.3	24.0			NP
GP-GM	0	9.9	100	80.3	50.5	# 36.5	26.7	10.1	29.4			NP
GP-GM	0	13.2	100	77.8	36.6	20.3	15.3	5.4	28.0			NP
SP-SM				100	94.2	80.7	10.8	7.2		8.68	3.42	NP
GP			100		34.4	26.2	17.3	2.1	23.8			NP
SP-SM		0	100	98.6	96.1	78.7	62.9	10.0				NP

EXISTING TEST DATA PAGE 7 OF 20 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMG

TABLE A-2

TURRO MATIONAL INC.

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MAP NUMBER	SITE	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
314	14087	USDH Millard Co.	W. Sevier Desert	Aol	Sandy Gravel
315	14088	USDH Millard Co.	W. Sevier Desert	Aol	Gravelly Sand
316	14089	USDH Millard Co.	Long Ridge	Aol	Sand, Gravel
317	14090	USDH Millard Co.	Long Ridge	Aal	Sandy Gravel
318	14091	USDH Millard Co.	Long Ridge	Aal	Sandy Gravel
319	14092	USDH Millard Co.	Long Ridge	Aol	Gravelly Sand
320	14093	USDH Millard Co.	Whirlwind Valley	Aol	Clayey Gravel
321	14094	USDH Millard Co.	Whirlwind Valley	Aol	Clayey Gravel
322	14095	USDH Millard Co.	Whirlwind Valley	Aal	Clayey Gravelly Sand
323	14096	USDH Millard Co.	Sawtooth Cove	Aol	Clayey Gravel
324	14097	USDH Millard Co.	Sawtooth Cove	Aal	Sandy Gravel
325	14098	USDH Millard Co.	Central Tule Valley	Aol	Sandy Gravel
326	14099	USDH Millard Co.	Central Tule Valley	Aaf	Sandy Gravel
327	14100	USDH Millard Co.	Central Tule Valley	Aaf	Sandy Gravel
328	14101	USDH Millard Co.	Central Tule Valley	Aaf	Sandy Gravel
329	14102	USDH Millard Co.	Central Tule Valley	Aol	Sandy Gravel
330	14103	USDH Millard Co.	Kings Canyon	Aaf	Sandy Gravel
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3 MAR 80

1	USCS	BEFO CRUSH PERC	HING.		ERCEN	T PASTO 1"	SING	AFTER IMUM S NO.	R S1 ZE NO. 200	NO ISAN PER C 131 WEAR C 131 WEAR	SSENONOS PERCECA	SY)	PLASTICITY INDEX (ASTM D 423 and D 424)
	GP SP-SM GP GP-GM GP-GM GC-GM GM-GC GM-SM GM-GC GP GP-GM GP-GM GP-GM	2.8 3.9 2.9 0 3.0 2.9	1.0 7.6 15.4 22.7 15.0 12.4 10.6 19.1 24.3 28.6 31.8 10.3 44.0	100 100 100 100 100 100 100 100	72.8	50.7 54.5 49.4 50.2 57.8 39.1 38.5 38.9 30.4 49.7 24.6 42.6	63.6 5.8 38.0 41.1 41.9 27.4 41.7 25.6 21.4 31.5 22.7 31.5 23.6 31.5 23.6	37.1 #.8 23.2 #.1 18.6 #.15.8 #.15.8 #.11.5 13.7 #.16.6	11.8 5.3 7.3 8.0 10.4 12.1 5.2 5.0 2.1 7.8 6.8 7.7	19.1 23.9 30.1 26.0 26.1 24.7 24.4 18.7 25.1 22.1 16.6	1.87	5.39	NP NP NP 4 NP 7 6 5 4 NP NP NP NP NP NP

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EXISTING TEST DATA PAGE 8 OF 20 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 800

TABLE A-2

URRO NATIONAL INC.

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	uscs	JLOERS J/OR COBBLES RCENT	TH	RIBN ERIAI NI CO PERC
MAP N	STATION	FOORTION	UNIT	DESCRIPTION	SYMBOL	BOULDERS AND/OR C PERCENT	GRAVEL	UNF
80	UGS-A80	Ford Pass	٧u	Rhyolite				
81	UGS-A81	Spring Valley	Mu	Quartzite	ļ			
82	UGS-A82	Spring Valley	Aaf	Sandy Gravel	GW			
83	UGS-A83	Spring Valley	Aaf	Sandy Gravel	GP	5	75	20
84	UGS-A84	Spring Valley	Aol	Sandy Gravel	GP	T	85	15
85	UGS-A85	Spring Valley	Aol	Gravelly Sand	SP	5	45	55
86	UGS-A86	Spring Valley	Do	Limestone				
87	UGS-A87	Spring Valley	Aol	Sandy Gravel	GP	0	65	35
88	UGS-A88	Sacramento Pass	Mu	Limestone				
89	UGS-A89	Sacramento Pass	Ls	Limestone				
90	UGS-A90	Snake Valley	Aaf	Silty Sand	SP			
91	UGS-A91	Enake Valley	Cau	Limestone	,			
92	UGS-A92	Snake Valley	Qtz	Quartzite				
93	UGS-A93	Ferguson Desert	Aal	Sandy Gravel	GP	T	55	45
94	UGS-A94	Tule Valley	Do	Dolomite				
95	UGS-A95	Tule Valley	Aol	Gravelly Sand	SP	0	40	55

FIELD OBSERVATIONS																
	TO I DIST			OBSERVATI	ONS		<u> </u>					LABO	RATORY	TEST	DATA	
Î	TERIAL HAN COL PERCEI	FINER BBLES, NT	PL ASTICITY	HARDNESS	WEATHERING	DELETERIOUS		\$	SIEVE	MALYSI	S. PEF	CENT I	PASSING	(ASTN	C 136	3)
TEMMET	SAND	FINES	PLA	HA	WEAT	MATERIALS	3"	1½"	3/4"	3/8"	NO.	NO. 8	NO. 16	NO. 30	NO. 50	NO. 100
	20 15 55	5 0 T	Low None None	Hard Very Hard	Moderate Fresh	40% volcanic glass, zeolites none caliche coatings caliche coatings caliche coatings caliche coatings	100	85.4	65.3	47.9	36.5	30.8	25.6	19.2	10.0	4.3
	35 45 55	0 5	None None	Very Hard Hard Very Hard Very Hard	Moderate Slight Slight Moderate Fresh	_	100	91.6	86.4	78.8	67.7	51.4	29.5	9.6	2.8	1.1

SIS. PERCENT PASSING (ASTM C 136) NO. NO. NO. NO. NO. NO. NO. NO. WEAR OR A B 16 30 50 100 200 PERCENT LOSS CA FA 19.2 10.0 4.3 1.3 17.0 0.45 5.45 E		_T				LABORATORY TEST DATA							
NO. NO. NO. NO. NO. NO. NO. NO. NO. NO.	RANKING	ASTR C 88)	SOUNDMESS	ABRASION TEST ASTH C 1313)		<u> </u>			S. PER	23	
27.1 0.25 A 25.6 19.2 10.0 4.3 1.3 17.0 0.45 5.45 E	\$	T LOSS	PERCEN		NO.	NO.	NO.	NO.	NO.	NO.	NO.		
9 36.5 30.8 25.6 19.2 10.0 4.3 1.3 17.0 0.45 5.45 E		FA	CA	WEAN	200	.00		- 50		-	*		
9 36.5 30.8 25.6 19.2 10.0 4.3 1.3 17.0 0.45 5.45	С												
	A		0.25	27.1									
	B ₁	5.45	0.45	17.0	1.3	4.3	10.0	19.2	25.6	30.8	36.5	9	
	A											!	
	A												
	В	1											
	B ₂												
	B ₁												
	A												
	В					i							
8 67.7 51.4 29.5 9.6 2.8 1.1 0.5	В	31.1			0.5	1.1	2.8	9.6	29.5	51.4	67.7	3	
	В												
	A												
	A												
	A												
	A												
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FIELD STATION AND SUPPLEMENTARY TEST BATA PAGE 7 OF 14 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO

WORD NATIONAL INC.

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TABLE

A-1

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	uscs	OBBLES,	DIST MAT TH	RI ERI AN PE
MAP	STATION		UNIT	DESCRIPTION	SYMBOL	BOULDERS AND/OR COBBLES PERCENT	GRAVEL	
96	UGS-A96	Tule Valley	Aal	Sandy Gravel	GP	T	55	4
97	UGS-A97	Tule Valley	Su	Limestone				
98	UGS-A98	Tule Valley	Aol	Gravelly Sand	GP	T	3 5	6
99	UGS-A99	Tule Valley	Su	Limestone				
100	NGS-A100	Antelope Range	٧u	Ash Flow				
101	UGS-A101	Twin Peaks	Su	Limestone				
102	UGS-A102	Great Salt Lake Desert	Gr	Granite				
103	UGS-A103	Great Salt Lake Desert	Aol	Sandy Gravel	GP	T	75	4
104	NGS-A104	Tippet Pass	٧u	Andesite			i	
105	NGS-A105	Antelope Valley	Ls	Limestone				
106	NGS-A106	Antelope Valley	Aol	Gravelly Sand	SP	0	50	4
107	NGS-A107	Antelope Valley	Aol	Gravelly Sand	SP	0	40	
108	NGS-A108	Antelope Valley	Vu	Rhyodacite				
109	UGS-A109	Ibapah	Aol	Gravelly Sand	SP	T	35	
110	UGS-A110	White Sage Flat	٧u	Dacite				

		 _	F	ELD O	BSERVATIO	DNS							LABO	RATORY	TEST	DA
BOULDERS AND/OR COBBLES PERCENT	BIST MAT TH	RIBUTI ERIAL F AN COBI PERCENT	1	PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS		S	I EVE A	NALYSI	S, PER	CENT P	ASSING	(ASTM	C
BOULDE AND/OR PERCEN	GRAVEL	SAND	FINES	PL AS	HARI	WEAT	MATERIALS	3*	1½**	3/4**	3/8**	NO. 4	NO. 8	NO. 16	NO. 30	
T	55 35	45 65	T	None None	Hard	Slight	none 5 to 15% chert, calcite veins <5% chert.									
					Very Hard Hard Hard	Slight Slight Moderate Slight	<pre><5\$ chert, caliche coatings calcite veins 10\$ volcanic glass none none</pre>									
T	75	25	0	None	Very Hard Very Hard	Fresh Fresh	<5% chert <5% volcanic glass copper oxides									
0	50	50	0	None			none]			
0	40	60	0	None	Hard	Slight	caliche coatings 5% volcanic glass									
T	35	65	0	None	Very Hard	Slight	caliche coatings 10% chal- dony									

RATORY TEST DATA ASSING (ASTM C 136)						310H	WESS	(88 3	9	
ASSING ((ASTM	C 136)		ABRASION Test Kastu c 131	SOUNDNESS		RANKING	
NO. 16		NO. 30	NO. 50	NO. 100	NO. 200	PERCENT WEAR	PERCEN'	FA FA		
	:								A	
									B ₂	
							!			
									B ₁	
									A	
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									В	1
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									B ₁	
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									В	
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1	i						L_	1	l	l

FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 8 OF 14 UTAH-MEYADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE A-1

UGRO NATIONAL INC.

NUMBER	FIELD	LOCATION	EE0F0E1C	MATERIAL	uscs	OBBLES.	DIST MAT Th	RIBUT ERIAL AN COS PERCE
MAP	STATION		UNIT	DESCRIPTION	SYMBOL	BOULDERS AND/OR COB PERCENT	GRAVEL	SAND
111	NGS-A111	White Horse Pass	Su	Limestone				
112	UGS-B1	Lookout Pass	Ls	Limestone				
113	UGS-B2	Skull Valley	Cau	Limestone				
114	UGS-B3	Onaqui Range	Ls	Limestone				
15	UGS-B4	Rush Valley	Aaf	Sandy Gravel	GM	10	60	25
116	UGS-B5	Rush Valley	Aaf	Silty Sandy Gravel	GW			
17	UGS-B6	Tintic Mountains	Su	Limestone				
118	UGS-B7	Onaqui Mountains	Cau	Limestone				
119	UGS-B8	Gilson Mountains	Su	Limestone				
120	UGS-B9	Sheeprock Mountains	Mu	Quartzite	ļ .			
121	UGS-B10	Sheeprock Mountains	Mu	Quartzite				
122	UGS-B11	Canyon Mountains	Mu	Quartzite	{			
123	UGS-B12	Confusion Range	Ls	Limestone				
124	NGS-B13	West of Gandy	Aaf	Sandy Gravel	GP	5	65	35
125	UGS-B14	Confusion Range	Su	Limestone				

DAR SO

L				IELD OBSERVATIONS			,						LABOR	ATORY	TEST (DATA	
		TRIBUTI ERIAL I AN COBI PERCEN	ON OF INER ILES,	10177	HARDNESS	WEATHERING	DELETERIOUS		S	IEVE A	NALYSI:	S, PERI	CENT P	ISSING	(ASTM	C 136)
PENCENT	GRAVEL	SAND	FINES	PLASTICITY	HARD	WEATH	MATERIALS	3"	1½**	3/4**	3/8"	NO.	NO. 8	NO. 16	NO. 30	NO. 50	N(16
	65	25	15	Low	Hard Very Hard Hard Hard Very Hard Hard Very Hard Very Hard Very Hard Very Hard Very Hard Hard Hard	Fresh Slight Slight Slight Slight Slight Slight Slight Slight Slight Slight Slight Slight Slight	scattered calcite veins <5% chert none none caliche coatings, clay coatings caliche coatings none 5% chert none none none none none none none none	100	15°	67.5	3/6"		26.4	22.7	16.0	12.5	

ORY	TEST	DATA							
SING	(ASTM	C 136)		ABRASION TEST (ASTM C 131)	SOUNDNESS	(AST# C 88)	RANKING	
NO. 16	NO. 30	NO. 50	NO. 100	NO. 200	PERCENT WEAR	PERCEN CA		6 2	
						<u> </u>	- ' ' '		
								A	
								B ₁	
								В	
								В	
								B ₁	
2 2.7	16.0	12.5	8.2	2.8	26.3	4.27		B ₁	
								A	
								В	
								В	
				•				A	
								A	
								B ₁	
								В	
								В1	
								В	

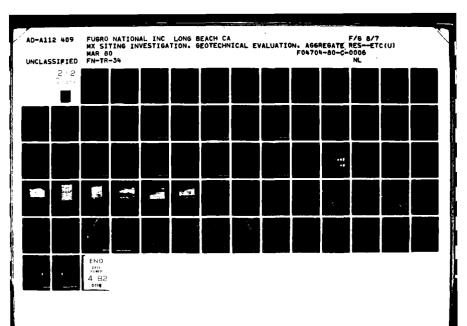
FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 9 OF 14 UTAH-NEVADA STUDY AREA

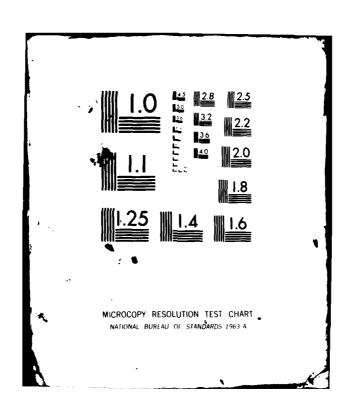
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE

UGRO NATIONAL INC.

MAP NUMBER	FIELD STATION	LOCATION	GEOLOGIC Unit	MATERIAL Description	USCS Symbol	ERS R COBBLES NT	DIST WATI	Ε
78	<u> </u>					BOULDERS AND/OR CO PERCENT	GRAVEL	
126	UGS-B15	Fish Springs Mountains	Vb	Basalt				
127	UGS-B16	Black Hills	Cau	Limestone				
128	UGS-B17	Topaz Mountains	Vu	Rhyolite				
129	UGS-B18	Desert Resort	Vb	Basalt				
130	UGS-B19	McDowell Mountains	Aaf	Sandy Gravel	GP	15	55	ĺ
131	UGS-B20	Simpson Range	Aol	Sandy Gravel	GP	15	55	
132	UGS-B21	Coyote Hills	Ls	Limestone				
133	UGS-B22	Deep Creek Range	Gr	Granite				
134	UGS-B23	Deep Creek Range	Gr	Granite				
135	UGS-B24	Deep Creek Range	Aaf	Sandy Gravel	GP	T	55	
136	UGS-B25	Fish Springs Range	Ls	Limestone				
137	UGS-B26	Swasy Range	Qtz	Quartzite				1
138	UGS-B27	Tule Valley	Cau	Dolomite				
139	UGS-B28	White Valley	Aaf	Sandy Gravel	GP	5	60	
140	UGS-B29	Sevier Desert	Aol	Sandy Gravel	GP	25	65	
141	UGS-B30	Sevier Desert	Vb	Basalt				
142	UGS-B31	Sevier Desert	Mu	Quartzite				





				IFID O	BSERVATIO	ONS							LARO	RATORY	TEST (IATA
\vdash	BIST	IRI BUTI	ON OF	1	JOERANIII	VI10							LADU	TAULT	1691	/A A
	TH	ERIAL F AN COBS PERCENT	INER	PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS		S	IEVE A	NALYSI	S, PER	CENT P	ASSING	(ASTM	C 136)
PERCENT	GRAVEL	SAND	FINES	PL AS1	HARC	WEATH	MATERIALS	3*	1½"	3/4"	3/8**	NO.	NO. 8	NO. 16	NO. 30	NO. 50
					Very Hard	Slight	5% vesicles									
					Very Hard Very Hard		10% volcanic									
					Very Hard	Slight	5% vesicles		:							,
	55	45	T	None			none									
	55	45	T	None			caliche coatings						'			
					Very Hard	Slight	10 to 30% chert] [
					Hard	Slight	none						ļ			
					Mod. Hard	Moderate	none									
	55	45	T	None			none									
					Hard	Slight	none									
					Very Hard	Fresh	none	i			i i					
					Hard	Slight	5% chert									
	60	40	T	None			caliche coatings					!				
	65	35	0	None			caliche coatings							:		
1					Hard	Slight	10% vesicles									
					Very Hard	Slight	none			:						
_1	_			L								L	<u> </u>	<u> </u>		

	RANKING	ross	FA	В	В	В	В	В	B ₁	C	1 1	В	B B ₂	B ₂	B ₂	B ₂	B ₂ A B	B ₂ A B	B ₂ A B A B B1	B ₂ A B A B
	SOUNDNESS	PERCEN'	CA		1.02	1.60					0.82						,		ļ	
	ABRASION TEST (ASTM C 131)	PERCENT WEAR	WEAR		26.9	32.2					19.2									
		NO. 200	200		!															
)	NO. 100	100															ŀ	j	
DATA	C 136	NO. 50	30															l		
TEST	(ASTN	NO. 30	30															ł		
RATORY	ASSING	NO.	16												Î			- {	l l	
8	P																	-	- 1	

FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 10 OF 14 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 8MG

TABLE A-1

WORD MATIONAL INC.

MAP NUMBER	FIELD Station	LOCATION	GEOLOGIC Unit	MATERIAL Description	USCS Symbol	BOULDERS AND/OR COBBLES PERCENT	GRAVEL MA	ERI AM (PER
	 				 	PEN	15	F
143	UGS-B32	Wah Wah Valley	Aol	Sandy Gravel	GW	10	65	3:
144	UGS-B33	Swan Peak	Vu	Andesite				
145	UGS-B34	Wah Wah Valley	Vu	Basalt				
146	UGS-B35	Escalante Desert	Gr	Granite				
147	UGS-B36	Mineral Mountains	VÞ	Basalt	! 			
148	UGS-B37	Sevier Desert	Ls	Limestone				e e
149	UGS-B38	Cricket Mountains	Ls	Limestone				
150	UGS-B39	Sevier Desert	Aaf	Sandy Gravel	GP	10	65	35
151	UGS-B40	Cricket Mountains	Aaf	Sandy Gravel	GP	20	60	*
152	UGS-B41	Escalante Desert	Aol	Gravelly Sand	SP	T	30	7
153	UGS-B42	Escalante Desert	٧u	Andesite				
154	UGS-B43	Wah Wah Valley	Su	Sandstone				
155	UGS-B44	Escalante Desert	٧u	Ignimbrite				

S BAR BO

											·					
212			FIELD (DBSERVATI	ONS							LABO	RATORY	TEST	DATA	
	TRIBUT TERIAL TAM COS PERCEN		PLASTICITY	HARDNESS	WEATHERING	DELETERIOUS		s	IEVE A	NALYSI	S. PER	CENT P	ASSING	(ASTM	C 136)
GRAVEL	SAND	FINES	P.L.AS1	HARD	WEATH	MATERIALS	3**	1½**	3/4**	3/8"	NO.	NO. 8	NO. 16	NO. 30	NO. 50	NO. 100
65 65	35 35	O	None	Hard Hard Mod. Hard Hard	Moderate Slight Moderate Slight Slight Slight	caliche coatings none 15% vesicles 10% mica 20% vesicles 10% volcanic glass none none caliche coatings										
30	70	T	None None	Hard Mod. Hard Soft	Slight Slight Moderate	<pre><5\$ volcanic glass 10\$ low density material 15\$ low density material Iron sulfides, friable material 15\$ chal- cedony, volcanic glass</pre>										

TEST DATA	DATA		_						
(ASTM C	C	136)		ABRASION TEST (ASTW C 131)	SOUNDNESS	(AST# C 04	RANKING	
	NO. 30	NO. 50	NO. 100	NO. 200		PERCEN CA	T LOSS	4	
								A	
								В	
				,				B ₂	
								С	
								B ₂	
								A	
								В	
								A	
						j		A	i
								В	
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								B ₂	
						;		B ₂	
		لـِـــا	Ĺ						

FIELD STATION AND SUPPLEMENTARY TEST BATA PAGE 11 OF 14 UTAH-MEYADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMG

TABLE A-1

UGRO NATIONAL INC.

NUMBER	FIELD	LOCATION	GEOLOGIC	MATERIAL	uscs	OBBLES	DIST MAT TH	ERI
HAP P	STATION	20071101	UNIT	DESCRIPTION	SYMBOL	BOULDERS AND/OR COBBLES PERCENT	GRAVEL	
156	UGS-845	Escalante Desert	Aaf	Gravelly Sand	SP	5	25	7
157	UGS-B46	Escalante Desert	۷u	Ignimbrite				
158	UGS-B47	Escalante Desert	Vu	Rhyolite				
159	UGS-B48	Escalante Desert	Vu	Ignimbrite	i			
160	UGS-B49	Escalante Desert	Aaf	Sandy Gravel	GP-GM	5	50	44
161	UGS-B50	Sevier Desert	Vu	Rhyodacite		ł.		
162	UGS-B51	Sevier Desert	Aaf	Silty Sand	ML	т	10	4
163	UGS-B52	Sevier Desert	Aaf	Sandy Gravel	GW	10	65	3
164	UGS-B53	Wah Wah Valley	Aol	Sandy Gravel	GW .	T	60	4
165	UGS-B54	Wah Wah Valley	Vu	Latite				
166	UGS-B55	Wah Wah Valley	Ls	Dolomite				
			<u> </u>					

		F	IELD O	BSERVATI	ONS							LABO	RATORY	TEST	DATA	
IIS AT TH	RIBUTI ERIAL I AN CODE PERCEN	ILES,	C1 (7	ESS	S	DELETERIOUS		s	IEVE A	NALYSI	S. PER	CENT P	ASSING	(ASTM	C 136)
GRAVEL	SAND	FINES	PLASTICI (Y	HARDNESS	WEATHERING	MATERIALS	3*	1½**	3/4"	3/8**	NO. 4	NO. 8	NO. 16	NO. 30	NO. 50	NO. 108
2 5	75	T	None •			5% chert. low density material										
				Soft	Moderate	5% volcanic glass & low density material										-
				Hard	Slight	20% volcanic glass & low density material	i			į			 			1
				Hard	Slight	20% low density material										
50	40	10	Low		,	5% low density material		:								
				Hard	Slight	5% volcanic glass							į			
10	40	50	Low	:		20% low density material										
6 5	35	0	!			5% low density material	!									
60	40	0	None		[<5% chert, caliche						•		1	1	
				Hard	Slight	5% volcanic glass										
:				Hard	Slight	25% chert		! !								
				ı												
														ļ P		

	RANKING
NO. NO. 100 200 PERCENT PERCENT LOSS CA FA	B₹
	_
	B ₂
	С
	B ₂
	В
	В
	C
	B ₁
	A
	3

FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 12 OF 14 UTAH-MEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE A-1

JERO NATIONAL INC

NUMBER	FIELD STATION	LOCATION	GEOLOGIC Unit	MATERIAL Description	USCS Symbol	BOULDERS AND/OR COBBLES PERCENT	DIST MAT TH
MAP						BOULDE AND/OR PERCEN	GRAVEL
167	UGS-B56	Wah Wah Valley	Aaf	Gravelly Sand	SP	5	45
168	UGS-B57	San Francisco Mountains	Aaf	Silty Sand	SM	0	10
169	UGS-B58	Beaver Mountains	Aaf	Gravelly Sand	SP	5	40
170	UGS-B59	Antelope Valley	Cau	Limestone			
171	UGS-B60	Pine Valley	Aaf	Sandy Gravel	GW	20	60
172	UGS-B61	Pine Valley	Cau	Limestone	1		
173	UGS-B62	Pine Valley	Aaf	Gravelly Sand	SW	15	45
174	UGS-B63	Wah Wah Valley	Aaf	Gravelly Sand	SW	T	35
175	UGS-B64	Wah Wah Valley	Aaf	Gravelly Sand	SP	T	40
176	UGS-B65	Wah Wah Valley	Vu	Rhyolite	,		
177	UGS-B66	Escalante Desert	٧u	Rhyolite			
178	UGS-B67	Escalante Desert	Aaf	Gravelly Sand	SP-SM	10	30
179	NGS-B68	Spring Valley	Aol	Sandy Gravel	GP	T	65
180	NGS-B69	Spring Valley	Au	Gravelly Sand	SW	T	30
					1		
					1	ľ	ĺ

<u> </u>			rittu i	DBSERVATI	ONS							LADA	RATORY	TEST	DATA	
Ľ	STRIBU ATERIAL THAM CO PERCE	TION OF FINER BBLES, ENT	110117	HARDNESS	WEATHERING	DELETERIOUS			SIEVE A	MALYSI	S, PER		ASSING			i)
COAVE	SAND	FINES	PL AS	HARI	WEATH	MATERIALS	3"	1½"	3/4**	3/8**	NO. 4	NO.	NO. 16	NO. 30	NO. 50	NO 100
												<u> </u>				
45	55	0	None		<u> </u>	caliche coatings										
10	60	30	None			caliche coatings										
40	60	T	None			caliche coatings						}				
		1	1	Hard	Slight	5% chert		}				}				
60	40	T	None			caliche coatings										
45	50			Hard	Slight	none	ļ									
	50	5	None			<5% low density material										
35	60	5	None			5% low density material										
40	60	T	None			<pre><5\$ chal- cedony, caliche coatings</pre>										
			1	Hard .	Slight	10% vesicles										
				Hard	Slight	10% volcanic glass										
30	60	10	Low		ļ	none				1						
65	30	5	None			caliche coatings			}	}						
30	65	5	None			caliche coatings			j							

RATORY	TEST	DATA					······································		
ASSING)		ABRASION TEST (ASTM C 131)	SOUNDNESS	(ASTH C 80)	RANKING	
NO. 16	NO. 30	NO. 50	NO. 100	NO. 200	PERCENT WEAR	PERCEN	T LOSS	-	
10	30	JU	100	200	MENU	CA	FA		
								B ₁	
								B ₂	
								В	
								Б	
								В	
								A	
								В	
								A	
	:							B ₁	
								B ₁	
					:			В	
								В	
								B ₂	
								В1	
								В	

FIELD STATION AND SUPPLEMENTARY TEST DATA PAGE 13 OF 14 UTAH-MEYADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE

ICO NATIONAL INC

MAP NUMBER	SITE	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL DESCRIPTION
331	14104	USDH Millard Co.	Little Valley	Aaf	Sandy Gravel
332	14105	USDH Millard Co.	S. Snake Valley	Aaf	Silty Gravelly Sand
333	14 106	USDH Millard Co.	S. Snake Valley	Aaf	Sandy Gravel
334	14107	USDH Millard Co.	Central Snake Valley	Aol	Sandy Gravel
335	14109	USDH Millard Co.	Central Snake Valley	Aol	Sandy Gravel
336	14110	USDH Millard Co.	Central Snake Valley	Aol	Gravelly Sand
337	14111	USDH Millard Co.	Central Snake Valley	Aol	
338	14112	USDH Millard Co.	Central Snake Valley	Aaf	Gravelly Sand
339	14113	USDH Millard Co.	Central Snake Valley	Aal	Gravelly Sand
340	14114	USDH Millard Co.	S. Snake Valley	Aal	Silty Sand
341	14115	USDH Millard Co.	S. Snake Valley	Aal	Sandy Gravel
342	14116	USDH Millard Co.	S. Snake Valley	Aal	Sandy Gravel
343	14117	USDH Millard Co.	S. Snake Valley	Aal	Sandy Gravel
344	14118	USDH Millard Co.	S. Snake Valley	Aaf	Gravelly Sand
		<u></u>			

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				SI	EVE A	NALYS	15			ABRASION TEST 1678- 6 134)	WESS	C 88)	PLASTICITY
	USCS Symbol	CRUS	ORE HING, CENT		PERCE			AFTE IMUM		ABRA Te Fastu	SOUNDNESS		INDEX
		>3**	>1"	1**	½ 	NO.	NO 8	NO 50	NQ. 200	PERCENT WEAR	PERI LO Ca	CENT SS FA	(ASTM D 423 and D 424)
	GP-GM			100		42.9	28.8	19.1	10.9		-		
and	GM/SM			100		'	۱.	. '	14.9				NP
	GM			100		50.3	• 37.0	27.0	13.7				
	GP	0	4.9	100	77.1	43.6	31.0	12.6	4.2	20 .9	1.33	3.13	NP
	GP-GM		6.4	100		48.6	35. 7	23.7	10.1	23.0			NP
	SP		7.7	100	82.6	62.6	48. 3	6.8	2.5	25.8	1.25	4.08	2
	GP/SP	0	18.6	100	75.0	51.3	39.9	9.4	4.4	25 .5	6.6	13.4	NP
	SP-SM	4.4	21.1	100		56.1	42.6	19.8	8.0	22.6			NP
	SM		į				66.9	58. 6	27.9	ļ			2
	GP-GM	0	29.6	100		44.9	29.2	15.8	7.9	23.8			NP
	GP-GM	0	22.1	100		36.6	26.3	15.9	7.7	22 .2		}	NP
	GP-GM	0	9.7	100				1	5.8	19.0			NP
	SP-SM	6.3	24.9	100		55.2	46.4	35.8	6.3	21.4			NP
	;									ļ i			
	SP-SM	6.3	24.9	100		55.2	46.4	35.8	6.3	21.4			NP

EXISTING TEST DATA
PAGE 9 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

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TABLE A-2

TUERO MATIONAL IMO

MAP NUMBER	SITE Number	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
345	14119	USDH Millard Co.	S. Snake Valley	Aal	Clayey Sandy Gravel
346	14120	USDH Millard Co.	S. Snake Valley	Aal	Silty Gravel
347	14121	USDH Millard Co.	S. Snake Valley	Aaf	Gravelly Sand
348	14122	USDH Millard Co.	S. Snake Valley	Aal	Silty Sand
349	14123	USDH Millard Co.	S. Snake Valley	Aal	Sandy Gravel
350	14124	USDH Millard Co.	S. Snake Valley	Aal	Clayey Gravelly Sand
351	14125	USDH Millard Co.	S. Snake Valley	Aaf	Sandy Gravel
352	14126	USDH Millard Co.	N. Pine Valley	Aal	Gravelly Sand
353	14127	USDH Millard Co.	N. Pine Valley	Aal	Gravelly Sand
354	14128	USDH Millard Co.	N. Pine Valley	Aal	Gravelly Sand
355	01001	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
356	01002	USDH Beaver Co.	E. Mineral Mountains	Au	Silty Clay
357	01003	USDH Beaver Co.	E. Mineral Mountains	Aaf	Sandy Gravel
358	01004	USDH Beaver Co.	E. Mineral Mountains	Aaf	
359	01005	USDH Beaver Co.	E. Mineral Mountains	Aaf	Sandy Gravel
360	01006	USDH Beaver Co.	E. Mineral Mountains	Aaf	Silty Sand
361	01007	USDH Beaver Co.	E. Mineral Mountains	Au	Gravelly Sand

				\$1	EVE A	NALYS	15			ABRASION TEST ISTM C 131)	NESS	C 88)	PLASTICITY
	USCS Symbol	CRUS	ORE HING. CENT			NT PAS TO 1		AFTE IMUM		ABRA Te (astiii	SOUNDNESS	(ASTM C	INDEX
	Í	>3"		1 **	1/2 m	NO.	NO.	NO. 50	NO. 200	PERCENT WEAR	PER((ASTM D 423 and D 424)
	<u> </u>	<u> </u>					-	30	200	WEAR	CA	FA	
1	GC	0	20.3	100		48.2	34.7	23.6	10.0	19.7			9
	GM	0	9.0	100		54.6	41.3	30.3	12.7	18.8	i		NP
	SP-SM	0	17.3	100		70.3	36.9	22.3	8.1	21.6		i	NP
	SM	0	6.6	93.4		61.1	42.0	29.3	16.3				NP
	GP-GM	0	16.4	100		45.4	29.1	14.8	5.8	25.8			1
nd	GC/SC	0	9.6	90.4		57.7	36.6	23.4	14.8				9
	GP-GM	1.7	21.8	100		42.1	27.7	13.2	5.1	22.8			4
	SP	5.3	18.3	100		54.0	31.3	11.0	4.7	27.1			NP
	SP-SM	11.6	18.4	100		60.0	45.8	26.1	8.8	23.4			NP
	SP	0	11.9	100	:	60.9	50.0	23.1	4.9	32.8			NP
	GP	0	27.9	100	71.3	49.2	36.7	15.3	4.0	44.5	0.4	5.3	NP
	CL	0	21.6	78.4		67.3	64.5	* 57.5	42.0				12
	GM-GC	16.0	46.0	100	71.7	37.5	29.1	10.2	5.1	28.0	23.9	13.5	5
	:		:										:
	GP-GM	30.6	61.1	100	68.8	40.1	31.9	9.9	5.1	30.0	17.9	16.9	NP
	SM	0	6.4	93.6		73.7	60.1	40.3	27.6				NP
	SP-SM	0	24.3	100	i	58.3	45.0	21.8	8.9	24.0			4
		L	L										

EXISTING TEST DATA
PAGE 10 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - 800

THE WORLD STREET

A-2

VERO NATIONAL INC

MAP NUMBER	SITE NUMBER	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
362	01008	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
363	01009	USDH Beaver Co.	E. Mineral Mountains	Aaf	Sandy Gravel
364	01010	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
365	01011	USDH Beaver Co.	E. Mineral Mountains	Aal	Silty Gravel
366	01012	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
367	01013	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
368	01014	USDH Beaver Co.	E. Mineral Mountains	Aal	Silty Sand
369	01015	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
370	01016	USDH Beaver Co.	E. Mineral Mountains	Aal	Sandy Gravel
371	01017	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
372	01018	USDH Beaver Co.	E. Mineral Mountains	Aol	Sandy Gravel
373	01019	USDH Beaver Co.	E. Mineral Mountains	Aaf	Sandy Gravel
374	01020	USDH Beaver Co.	E. Mineral Mountains	Au	Gravelly Sand
375	01021	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
376	01022	USDH Beaver Co.	E. Mineral Mountains	Aaf	
377	01023	USDH Beaver Co.	E. Mineral Mountains	Aal	Gravelly Sand
378	01024	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel

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	USCS	BEF CRUS	HING.		EVE A	NT PA	SSING			ABRASION Prof	ASTI C 131)	SOUNDNESS	ASTM C 88)	PLASTICITY INDEX
	SYMBOL	PER		1 -	HING	TO 1.	NO.	NO.	NO.	PER	ENT	PERC		(ASTM D 423 and D 424)
		>3*	>1"	1-	72	4	8	50	200	WEA	R	CA	FA	allu V 424/
	GP-GM	11.9	30.7	100	69.8	45.5	37.9	20.7	11.2	23.	.0	8.49	7.56	NP
	GP-GM		41.0	100	75.9		28.5	11.7	6.0	2).	.7			
	GP	12.7	41.0	100	57.0	29.3	19.2	5.7	2.2	25.	.6	4.88	8.78	NP
	GM	1.0	29.3	100	73.4	52.6	44.0	34.3	16.1	22.	.0	3.4	4.3	NP
	GP-GM	6.3	29.3	100	65.7	41.5	32.4	13.1	7.0	24.	.1	7.18	8.35	NP
	GP-GM	3.0	27.0	100	77.3	44.9	32.1	16.9	6.2	19.	.8			NP
	SM	0	9.0	91.0		63.0	55.0	35.0	14.0					
	GP		48.6	100	60.3	34.6	21.5	4.5	1.6	18.	9			NP
	GP	0	4.2	58.0		26.0	20.0	9.0	5.0					
	GP	12.5	43.0	100	61.6	36.0	22.0	10.0	5.0	17.	9	1.99	8.0	NP
	GP-GM	14.5	46.0	00	68.7	37.8	27.8	12.4	5.3	21.	0	0.92	4.48	NP
İ	GP	7.2	36.3	100		47.0	33.7	18.0	4.4	29.	3			NP
	GP/SP	0	30.4	100		51.9	38.1	15.2	4.1	21.	8			NP
	GP-GM	2.9	33.3	00		41.1	27.7	13.8	6.1	22.	4			NP
	}													
	SP-SM	0	22.7	00		59.3	44.7	24.5	7.8	24.	5			NP
	GP	7.9	37.2	00	5.3	31.5	22.0	7.3	2.8	23.	0			NP
]											

EXISTING TEST DATA
PAGE 11 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - 846

TABLE A-2

TURRO NATIONAL INC.

MAP NUMBER	SITE	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
379	01025	USDH Beaver	E. Mineral Mountains	Au	Sandy Gravel
380	01026	USDH Beaver	E. Mineral Mountains	Au	Silty Sandy Gravel
381	01027	USDH Beaver Co.	E. Mineral Mountains	Au	Gravelly Sand
382	01028	USDH Beaver Co.	E. Mineral Mountains	Au	Gravelly Sand
383	01029	USDH Beaver Co.	Minersville	Aaf	Silty Sand
384	01030	USDH Beaver Co.	Minersville	Aal	Silty Gravel
385	01031	USDH Beaver Co.	Minersville	Aaf	Gravelly Sand
386	01032	USDH Beaver Co.	Minersville	Au	Silty Sand
387	01033	USDH Beaver Co.	Minersville	Au	Silty Sand
388	01034	USDH Beaver Co.	North Escalante Desert	Au	Silty Sand
389	01035	USDH Beaver Co.	North Escalante Desert	Au	Gravelly Sand
390	01037	USDH Beaver Co.	North Escalante Desert	Aaf	Gravelly Sand
391	01038	USDH Beaver Co.	North Escalante Desert	Au	Silty Gravelly Sand
392	01039	USDH Beaver Co.	North Escalante Desert	Au	Silty Gravelly Sand
393	01040	USDH Beaver Co.	North Escalante Desert	Au	Silty Gravelly Sand

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				S	EVE A	NAL YS	SIS			ABRASION Test STM C 131	MESS	C 88)	PLASTICITY
ON T	USCS	CRUS	ORE SHING, CENT		PERCE Shing	NT PA TO 1		AFTE IMUM		ABBA T TAST#	S	(ASTIN C	INDEX (ASTM D 423
		-3	>1"	1-	×.	NO.	NO. 8	NO. 50	NO. 200	PE ICENT VEAR	PERI LO CA	ENT SS FA	and D 424)
	GP	8.9	35.0	100		47.7	36.9	8 21.0	4.2	23.7			NP
avel	GP-GM	7.3	28.3		68.7	41.8					2.58	7.57	NP
	SP-SM	0	9.3	100	80.0	55.2	38.5	18.9	7.7	22.6			NP
	SP-SM	0	16.9	100	80.3	54.9	46.8	16.3	6.5	22.0	24.8	29.7	NP
	SM	1.9	6.6	100	88.0	67.8	52.3	28.0	13.2	27.4			NP
	GM	5.8	25.1	100	74.9	50.3	42.1	25.8	16.2	27.2	2.48	4.41	NP
	GP/SP	0	9.0	100	83.0	53.0	35.0	10.0	5.0	28.0	4.96	13.0	NP
	SM	0	2.0	98.0		77.0	68.0	46.0	21.0			 	NP
	SM	0	8.0	92.0		63.0	56.0	41.0	17.0				NP
	SM	0	7.0	93.0		73.0	66.0	51.0	18.0				NP
	SP-SM	0	6.0	94.0		65.0	55.0	31.0	11.0			<u>.</u>	NP
ı	SP-SM	3.3	15.7	100	79.9	54.6	45.7	20.9	7.0	26.0	7.17	11.7	NP
Sand	GM/SM	0	13.0	87.0		59.0	53.0	39.0	17.0				NP
Sand	SM	0	10.0	90.0		61.0	54.0	39.0	15.0				NP
Sand	GM/SM	0	17.0	83.0		57.0	51.0	37.0	15.0				NP
			}	ł	Ì	Ì	1	}					

EXISTING TEST DATA PAGE 12 OF 20 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMG TABLE

FUERO NATIONAL INC

MAP NUMBER	SITE Number	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
394	01041	USDH Beaver Co.	North Escalante Desert	Aol	Silty Gravelly Sand
395	01042	USDH Beaver Co.	North Escalante Desert	Aol	Sandy Gravel
396	01043	USDH Beaver Co.	North Escalante Desert	Aal	Sandy Gravel
397	01045	USDH Beaver Co.	North Escalante Desert	Aal	Silty Gravelly Sand
398	01046	USDH Beaver Co.	North Escalante Desert	Aal	Sandy Gravel
399	01047	USDH Beaver Co.	North Escalante Desert	Aol	Sandy Gravel
400	01048	USDH Beaver Co.	North Escalante Desert	Aol	Sandy Gravel
401	01049	USDH Beaver Co.	North Escalante Desert	Aal	Gravelly Sand
402	01050	USDH Beaver Co.	North Escalante Desert	Au	Gravelly Sand
403	01051	USDH Beaver Co.	North Escalante Desert	Au	Gravelly Sand
404	01052	USDH Beaver Co.	North Escalante Desert	Au	Sandy Gravel
405	01053	USDH Beaver Co.	North Escalante Desert	Aaf	Sandy Gravel

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				SI	EVE A	NALYS	18	<u></u>		SION SI C 131)	NESS	C 88)	PLASTICITY
	USCS Symbol	BEF CRUS PERI	HING.		PERCEI HING	NT PA		AFTE IMUM		ABRASION TEST (AST# C 13	SOUNDNESS	(ASTII	INDEX (ASTM D 423
		×3 *	>1"	1"	¥••	NO. 4	NO. B	NO. 50	NO. 200	PERCENT WEAR	PERI Lo Ca	SS FA	and D 424)
d	SM	0	10.5	100	82.0	61.7	53.0	21.6	15.1	28 .9	2.75	4.0	NP
	GP-GM	2.7	15.7	100	70.8	47.6	39.1	16.8	8.0	2219	8.45	10.8	NP
	GP	5.6	28.0	100	67.2	43.0	34.8	11.8	4.8		2.77	4.32	NP
ad	GM-SM	0	14.8	100	76.6	56.5	46.7	21.5	13.1	30.4	2.93	7.08	NP
	GP			94.7	62.5	7.9	6.9	2.2		23.2	3.05	4.06	NP
	GP-GM	1.1	15.9	100	74.1	47.4	38.8	16.5	7.2	18.9	2.95	12.0	NP
	GP	0	26.8	100	69.7	36.5	21.1	# 13.3	4.3	38.8			NP
	SP	0	4.6	100	90.9	73.5	57.9	3.6	1.3	31.0	35.2	10.4	NP
	SP-SM	0	11.9	100	78.8	58.0	46.0	13.0	7.2	27,9	4.72	9.25	NP
	SP		12.5	100	84.9	60.1	39.5	11.4	3.7	20.6			NP
	GP		37.4	100		47.0	33. 3	13.8	4.6	21.3			NP
	GP-GM		28.6	100		51.0	34. 4	13.2	6.1	21.6			NP

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EXISTING TEST DATA
PAGE 13 OF 20
UTAN-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMB

TABLE A-2

TUERO NATIONAL INC

MAP NUMBER	SITE NUMBER	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
406	01054	USDH Beaver Co.	North Escalante Desert	Aal	Gravelly Sand
407	01055	USDH Beaver Co.	North Escalante Desert	Aaf	Gravelly Sand
408	01056	USDH Beaver Co.	Central Wah Wah Valley	Aaf	Gravelly Sand
409	01057	USDH Beaver Co.	Central Wah Wah Valley	Aal	Gravelly Sand
410	01058	USDH Beaver Co.	Central Wah Wah Valley	Aol	Sandy Gravel
411	01059	USDH Beaver Co.	Central Wah Wah Valley	Aaf	Sandy Gravel
412	01060	USDH Beaver Co.	Central Wah Wah Valley	Aaf	Gravelly Sand
413	01061	USDH Beaver Co.	Central Wah Wah Valley	Aaf	Sandy Gravel
414	01062	USDH Beaver Co.	Central Wah Wah Valley	Aaf	Sandy Gravel
415	01063	USDH Beaver Co.	N. Pine Valley	Aaf	Gravelly Sand
416	01064	USDH Beaver Co.	N. Pine Valley	Aaf	Sandy Gravel
417	01065	USDH Beaver Co.	N. Pine Valley	Aaf	Sandy Gravel
418	01066	USDH Beaver Co.	N. Pine Valley	Au	Gravelly Sand
419	01067	USDH Beaver Co.	N. Pine Valley	Aol	Gravelly Sand

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AFTE	R SIZE	ABRASION TEST (ASTM C 131)	SOUNDNESS	PLASTICITY INDEX (ASTM D 423			
NO. 50	NO. 200	PERCENT WEAR	PERI LO CA	ENT SS FA	and D 424)		
13.3	4.1	24.0			NP		
24.1	9.9	24.6			NP		
# 18.9	8.4	25.8			NP		
30.9	11.4	26.0			NP		
25.0	7.8	24.8			NP		
22.8	9.2	22.6		!	NP		
21.9	9.7	29.2	4.43	10.9	NP		
11.7	3.7	28.3			NP		
# 18.4	5.8	24.6			NP		
20.9	7.6	28.8			NP		
13.2	5.7	27.9			NP		
21.4	8.1	28.3	:		NP		
13.1	3.6	23.8			NP		
5.7	0.5	26.1			NP		

MAP NUMBER	SITE Number	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
420	01068	USDH Beaver Co.	E. Mineral Mountains	Au	Sandy Gravel
421	11001	USDH Iron Co.	Parowan Valley	Aaf	
422	11002	USDH Iron Co.	Parowan Valley	Aaf	Sandy Gravel
423	11003	USDH Iron Co.	Parowan Valley	Aaf	Sandy Gravel
424	11004	USDH Iron Co.	Parowan Valley	Au	Sandy Gravel
425	11005	USDH Iron Co.	Parowan Valley	Aaf	Silty Gravel
426	11006	USDH Iron Co.	Parowan Valley	Aaf	Gravelly Sand
427	11007	USDH Iron Co.	Parowan Valley	Aaf	Silty Sandy Gravel
428	11008	USDH Iron Co.	Parowan Valley	Aaf	Sandy Gravel
429	11009	USDH Iron Co.	Parowan Valley	Aaf	Gravelly Sand
430	11010	USDH Iron Co.	Buckskin Valley	Aaf	Gravelly Sand
431	11011	USDH Iron Co.	Bear Valley Junction	Aal	Sandy Gravel
432	11012	USDH Iron Co.	Bear Valley Junction	Aal	Sandy Gravel
433	11013	USDH Iron Co.	Bear Valley Junction	Aal	Sandy Gravel
434	11014	USDH Iron Co.	Bear Valley Junction	Aal	Sandy Gravel
435	11015	USDH Iron Co.	Parowan Valley	Aal	Silty Sand
436	11016	USDH Iron Co.	Parowan Valley	Aal	Silty Sand

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				SI	EVE A	NALYS	18			ABRASION Test Stir C 131)	SOUNDNESS	C 88)	PLASTICITY
	SAMBOF	BEF CRUS PER	HING,		PERCEI			AFTE		ABRA TE KASTM		(ASTM C	INDEX (ASTM D 423
		> 3 **	>1"	1**	¥**	NO.	ND. B	NO. 50	NO. 200	PERSENT WEAR	PERIO LO Ca	ENT SS FA	and D 424)
	GP-GM	30.6	53.5	100	89.2	43.7	32.8	11.2	5.2	22.7	3.71	7.12	NP
	GP	0	27.7	100	70.1	35.7	29.8	12.9	5.0	24.3	5.49	11.3	NP
	GP-GM	0	11.6	100		45.9	33.8	18.5	7.2	23.04			NP
	GP-GM	4.6	B8.2	100		45.6	30.1	15.5	5.7	22.42			NP
:	GM	10.0	85.0	100		56.0	48.0	35.0	18.0	22.1			NP
	SP-SM	1.9	14.2	100	85.6	64.8	56.6	21.7	9.3	28.4	12.23	25.49	NP
L	GM-SM	10.0	B6.0	100		57.0	49.0	24.0	13.0	28.1			NP
	GP		39.1	100		44.9	34.1	# 14.4	3.4	26.7			NP
:	SP-SM	0.5	13.5	100	78.0	55.0	44.0	16.0	7.0	27.0	14.58	23.79	NP
	SP-SM	1.3	9.2	100	86.0	64.4	52.9	25.4	11.0	27.5	22.35	19.53	NP
	GP-GM	22.8	55.7	100		40.5	31.5	20.1	8.3	23.9			NP
i	GP-GM	0	8.09	100		49.3	38.8	25.7	9.6	29.16			NP
	GP	9.9	29.0	100		45.7	29.4	16.4	4.8	22.0			4
	GP	7.9	B2.4	100		43.3	27.5	12.1	3.8	23.9			NP
	SM	0	10.1	89.9		73.9	67.6	51.6	13.7				NP
	SM	0	6.2	93.8		68.0	67.3	₩ 44.3	12.0				NP

EXISTING TEST DATA
PAGE 15 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE A-2

UGRO NATIONAL INC.

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MAP NUMBER	SITE NUMBER	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
437 438	11017	USDH Iron Co.	Parowan Valley Parowan	Aal Aaf	Silty Sand Sandy Gravel
439	11019	USDH Iron Co.	Valley Parowan Valley	Aal	Silty Sand
440	11020	USDH Iron Co.	Parowan Valley	Aal	Sandy Gravel
441	11021	USDH Iron Co.	Parowan Valley	Aaf	Sandy Gravel
442	11023	USDH Iron Co.	Parowan Valley	Aal	Gravelly Sand
443	11024	USDH Iron Co.	Parowan Valley	Aal	Sandy Gravel
444	11025	USDH Iron Co.	Parowan Valley	Aaf	Sandy Gravel
445	11037	USDH Iron Co.	Cedar Valley	Aaf	Silty Sand
446	11038	USDH Iron Co.	Cedar Valley	Aaf	Silty Gravelly Sand
447	11039	USDH Iron Co.	Cedar Valley	Aaf	Silty Gravel
448	11040	USDH Iron Co.	Cedar Valley	Aaf	Sandy Gravel
449	11041	USDH Iron Co.	Cedar Valley	wal	Sandy Gravel
450	11042	USDH Iron Co.	Cedar Valley	Aal	Sandy Gravel
451	11043	USDH Iron Co.	Cedar Valley	Aal	Silty Sand
452	11044	USDH Iron Co.	Cedar Valley	Aaf	Clayey Sand
453	11045	USDH Iron Co.	Cedar Valley	Aal	Silty Sand

3 MAR 80

	ueae	25	200	SI	EVE	ANALY	\$18			ABRASION TEST STM C 131)	SOUNDNESS	TM C 88)	PLASTICITY
	SAMBOF N2C2	CRUS	ORE HING, CENT		PERCE Shing	NT PA		AFTE		ABR	L.	(AS	INDEX (ASTM D 423
		> 3 **	>1"	1 ==	1,500	NO.	NO. 8	NO. 50	NO. 200	PERCENT WEAR	PER LO CA	CENT SS FA	and D 424)
	SM	0	3.8	96.2		68.6	59.9	45.3	16.1		ļ		NP
	GP		38.2	100	[28.2	20.3	10.	2.2	21.16			NP
	SM	3.2	9.4	93.8	}	68.0	67.3	44.3	12.0				NP
	GP		25.0	100		30.5	24.1	12.8	3.0	25.14			NP
	GP		25.7	100		39.4	28.2	13.0	3.4	23.7			NP
	SP-SM	0	0	100	85.5	56.0	41.5	16.0	8.5	17.2	6.42	11.4	NP
	GP	3.2	21.3	100		40.5	29.5	19.0	4.1	30.0			NP
	GP-GM	0	13.9	100	76.2	48.4	42.2	29.3	6.4	30.1	12.13	6.10	NP
	SM			100		70.6	54.1	31.5	14.9				NP
d	SM	5.2	14.2	100	86.0	64.5	54.3	29.4	15.6	24.18	6.68	13.14	2
	GM	0	17.0	83.0		58.0	51.0	42.0	19.0				NP
	GP-GM		11.8	100	61.8	21.7	16.8	13.6	6.1	29.8	16.29	4.8	
	GP	7.7	32.3	100	62.2	35.5	29.3	11.8	3.1	30.8	13.4	13.7	NP
	GP	0	22.1	100	67.0	38.8	27.6	18.8	3.3	29.2	17.2	13.3	NP
	SM		8.0	92.0		66.0	61.0	52.0	24.0				NP
	SM-SC	0	7.3	92.7	[74.8	69.7	59.7	34.0				14
	SM	0	6.0	94.0		69.0	60.0	48.0	24.0				NP

EXISTING TEST DATA PAGE 18 OF 20 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 880

TABLE A-2

MAP NUMBER	SITE	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
454 455 456 457	11046 11047 11048 11049	USDH Iron Co. USDH Iron Co. USDH Iron Co. USDH Iron Co.	Cedar Valley Cedar Valley Cedar Valley Cedar	Aal Aal Aaf	Sandy Gravel Clayey Gravel Clayey Sandy Gravel Silty Gravel
458 459 460	11050 11051 11052	USDH Iron Co. USDH Iron Co. USDH Iron Co.	Valley Cedar Valley Cedar Valley Cedar Valley Valley	Aaf Aaf	Sandy Gravel Sandy Gravel Sandy Gravel
461 462 463	11053 11054 11055	USDH Iron Co. USDH Iron Co. USDH Iron Co.	Cedar Valley Cedar Valley Cedar	Au Aaf Aaf	Silty Gravel Silty Sand Gravelly Sand
464 465 466	11056 11057 11058	USDH Iron Co. USDH Iron Co. USDH Iron Co.	Valley Cedar Valley Cedar Valley Cedar Valley Valley	Aaf Aal Aaf	Silty Sand Clayey Sand Clayey Silt
467 468 469 470	11059 11060 11061 11062	USDH Iron Co. USDH Iron Co. USDH Iron Co. USDH Iron Co.	Cedar Valley Cedar Valley Cedar Valley Cedar Valley	Au Au Aaf Aal	Sandy Gravel Clayey Silty Sandy Gravel Sandy Gravel

MAR BO

				SI	EVE A	NALYS	18			ABRASION Test STM C 131)	NESS	C 88)	PLASTICITY
	SYMBOL	BEF CRUS PER	HING,			NT PAS TO 1'		AFTE IMUM		ABRA TE (ASTM	SOUNDNESS	(AS	INDEX (ASTM D 423
	!	>3*	>1*	1 ~	1/2 000	NO.	NO. B	NO. 50	NO. 200	PERCENT WEAR	PERI LO CA	22	and D 424)
										-	UA	FA	
,	GP-GM	0	41.0	59.0		33.0	29.0	22.0	9.0				NP
	GC	0	4.0	96.0		63.0	56.0	45.0	28.0				9
	GM-GC	0	24.0	76.0		45.0	40.0	32.0	16.0				5
	GM	4.4	17.5	100	82.3	55.8	46.2	33.2	12.9		10.2	8.7	NP
	GP	0	18.6	71.4		36.4	30.6	21.4	4.3				NP
	GP-GM	13.8	26.8	73.2		49.8	45.3	38.1	11.5				NP
	GP	6.2	32.7	100	70.3	40.9	32.5	20.1	3.9	26.0	7.1	16.0	NP
	GM	8.2	36.6	100	81.5	51.6	43.3	37.6	12.2	26.0	9.5	7.6	NP
	SM	0	4.4	95.6		76.1	67.0	48.8	21.5				NP
	SP-SM	0	19.5	100	82.2	61.3	54.0	37.0	9.5	47.5	41.0	21.6	NP
	ML	0	0	100		88.7	86.2	79.8	52.9	<u>.</u>			1
	sc	0	6.0	94.0		77.0	69.0	49.0	29.0				8
	ML	0	0	100		99.5	97.1	86.8	73.8				3
	GP-GM	13.3	50.0	100	71.3	46.1	39.0	23.6	10.1	37.0	12.6	14.7	NP
	ML	0	0	100		100	99.7	94.0	60.5				3
	GP-GM	3.7	31.4	100	65.8	34.7	27.5	17.4	10.1	30.0	16.4	16.4	2
	GP-GM	0	21.0	100	76.1	48.9	42.2	30.4	10.8	32.2	8.99	5.34	NP

EXISTING TEST DATA
PAGE 17 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMG

TABLE A-2

TURRO MATIONAL INC.

2.

MAP NUMBER	SITE NUMBER	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
471	11063	USDH Iron Co.	Cedar	Aal	Gravelly Sand
'	_		Valley		
472	11064	USDH Iron Co.	Cedar Valley	Au	Sandy Gravel
473	11065	USDH Iron Co.	Cedar Valley	Au	Clayey Gravelly Sand
474	11066	USDH Iron Co.	Black Mountains	Aaf	Sandy Gravel
475	11067	USDH Iron Co.	Black Mountains	Au	Sandy Gravel
476	11068	USDH Iron Co.	Cedar Valley	Au	Sandy Gravel
477	11069	USDH Iron Co.	Cedar Valley	Au	Silty Sand
478	11070	USDH Iron Co.	Cedar Valley	Aaf	Gravelly Sand
479	11071	USDH Iron Co.	South Escalante Desert	Aaf	Gravelly Sand
480	11072	USDH Iron Co.	South Escalante Desert	Au	Sandy Gravel
481	11073	USDH Iron Co.	South Escalante Desert	Aol	Gravelly Sand
482	11074	USDH Iron Co.	South Escalante Desert	Aaf	Gravelly Sand
483	11075	USDH Iron Co.	South Escalante Desert	Aaf	Gravelly Sand
484	11076	USDH Iron Co.	South Escalante Desert	Aaf	Sandy Gravel
485	11077	USDH Iron Co.	South Escalante Desert	Aaf	Gravelly Sand

MAG A

			\$1	EVE A	MALYS	318			ABRASION TEST ISTM C 131)	NESS	(88)	PLASTICITY
USCS Symbol	CRUS	ORE HING, CENT		PERCE SHING			AFTE IMUM		ABRA TE (ASTM	2	(ASTN C	INDEX (ASTM D 423
	>3"	>1"	1**	<i>1</i> ½ **	NO.	NO.	NO.	NO. 200	PERCENT WEAR		CENT	and D 424)
	 	<u> </u>			\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	-	-	200		CA	FA	
SP			100	92.1	85.0	67.9	18.3	4.1	40.9	32.2	25.0	NP
GM-GC	6.3	40.6	100	72.3	42.5	33.4	19.4	11.8	34.0	24.1	10.0	5
SM-SC	16.9	29.6	87.3		66.6	55.3	41.9	30.8				5
GP-GM	0	0	100	80.2	52.4	41.9	17.1	8.8	25.5	11.0	11.0	NP
GP	0	10.1	89.9	73.1	49.0	39.8	14.8	3.1			35.7	NP
GP			100	73.0	18.7	8.8	3.7	2.1	24.0	2.94	12.27	
SM	0	0	100	90.5	74.5	64.8	39.0	18.2			16.9	NP
SP-SM		3.8	100	85.9	68.3	56.4	36.0	9.4	32.0			NP
SP	0	0	100	93.4	83.2	72.2	20.9	3.9	24.8	12.5	12.5	NP
GM-GC		20.4	100	69.9	31.0	24.9	17.2	7.5	29.82			6
SP			100		70.1	52. 0	25.1	4.8	30.4			NP
SP		6.1	100	90.3	75.2	54.2	13.9	3.8	27.1			NP
SP-SM	0	14.7	100	84.9	61.7	47.9	26.5	9.0	30.0			NP
G₽		34.0	100	69.3	32.3	22.0	9.2	3.8	28.1			NP
SP	0	25.0	100	91.0	64.0	43.0	10.5	5.0	23.1	14.3	15.25	NP
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EXISTING TEST DATA PAGE 18 OF 20 UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE ~ 9800

A-2

VERO NATIONAL INC

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HAP NUBER	SITE	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
486	1 1078	USDH Iron Co.	South Escalante Desert	Aaf	Gravelly Sand
487	11079	USDH 1ron Co.	South Escalante Desert	Aaf	Clayey Sand
488	1 1080	USDH Iron Co.	South Escalante Desert	Aol	Silty Sand
489	11080	USDH Iron Co.	South Escalante Desert	Au	Silty Sand
490	11082	USDH Iron Co.	South Escalante Desert	Aol	Gravelly Sand
491	11083	USDH Iron Co.	South Escalante Desert	Aol	Gravelly Sand
492	11084	USDH Iron Co.	South Escalante Desert	Aol	Silty Sand
493	11085	USDH Iron Co.	South Escalante Desert	Ao1	Gravelly Sand
494	11086	USDH Iron Co.	South Escalante Desert	Aaf	Sandy Gravel
495	11087	USDH Iron Co.	South Escalante Desert	Au	Gravelly Sand
496	11088	USDH Iron Co.	South Escalante Desert	Ams	Gravelly Sand
497	11089	USDH Iron Co.	South Escalante Desert	Aal	Sandy Gravell
498	11090	USDH Iron Co.	South Escalante Desert	Au	Gravelly Sand

WAR 88

USCS SYMBOL BEFORE CRUSHING, PERCENT >3" >1"			PERCENT PASSING AFTER CRUSHING TO 1" MAXIMUM SIZE 1" ½" NO. NO. NO. NO. NO. 200					SIZE NO.	VOISANDA PERTENT MEAR (ASTM C 131)	PERCENT LOSS CA FA		PLASTICITY INDEX (ASTM D 423 and D 424)
SP		8.2	100		70.5	56.4	17.4	3.7	29.1			NP
sc			100			9 1.3	6 9.4	45.6				8
SM	[100	ļ	91.9	8 2.4	# 52.1	22.7				NP
SM			100	100	100	98. 3	83.2	48.9				2
SP-SM			100		69.3	58.0	25.3	7.5	26.7			NP
SP			100		72.4	54.3	13.7	2.3	29.9			NP
SP-SM			100		93.1	78.8	41.2	11.0				NP
SP-SM		1.5	100		65.3	48.6	17.6	6.6	28.6			NP
GM	0.7	11.7	100	79.7	55.0	45.2	21.2	13.6	21.4	8.42	10.62	3
SM-SC		18.8	100	80.7	57.7	49.0	17.7	11.2	24.9	8.34	10.38	5
SP-SM	11.0	27.7	100		68.6	57.6	33.6	11.6	26.6			
GP-GM		23.5	100		53.4	41.9	23.4	9.7	29.8			NP
SP		29.5	100	83.6	61.0	42. 2	12.7	4.6	26.8			

EXISTING TEST DATA
PAGE 10 OF 20
UTAH-NEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE A-2

TUBRO NATIONAL INC.

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MAP NUMBER	SITE NUMBER	DATA Source	LOCATION	GEOLOGIC UNIT	MATERIAL Description
499	11091	USDH Iron Co.	South Escalante Desert	Aaf	Gravelly Sand
500	27070	USDH Washington Co.	Kane Spring Draw	Au	Sandy Gravel
501	27071	USDH Washington Co.	Kane Spring Draw	Aaf	Clayey Sand
502	27072	USDH Washington Co.	Kane Spring Draw	Au	Silty Sand
503	27073	USDH Washington Co.	Kane Spring Draw	Au	Sandy Gravel
504	27074	USDH Washington Co.	Kane Spring Draw	Au	Sandy Gravel
505	27075	USDH Washington Co.	South Escalante Desert	Au	Gravelly Sand
506	27076	USDH Washington Co.	South Escalante Desert	Aaf	Sandy Gravel
507	27077	USDH Washington Co.	South Escalante Desert	Aaf	Gravelly Sand
508	27078	USDH Washington Co.	South Escalante Desert	Aal	Silty Gravelly Sand

3 BAR 80

	USCS Symbol	<u> </u>		SI	EVE A	NALYS	18	ABRASION TEST ISTM C 131)	INESS	C 88)	PLASTICITY		
		BEFORE CRUSHING. PERCENT		PERCENT PASSING AFTER CRUSHING TO 1" MAXIMUM SIZE						ABRA TE (ASTM	SOUNDNESS TEST (ASTM C 88		INDEX (ASTM D 423
		>3**	>1"	1~	¥**	ND. 4	NO. 8	NO 50	NO. 200	PERCENT WEAR	PERI Lo Ca	ENT SS FA	and D 424)
										_			
	SP-SM	4.3	14.3	100	89.1	69.1	60.0	23.5	10.1	26.5	10.50	10.40	NP
	GP	0	0.8	100	92.5	43.9	26.4	7.8	1.6	42.1	0.71	41.7	NP
	SM-SC	0	9.7	90.3		70.6	54.7	44.4	27.9				4
	SP-SM	6.6	17.1	100	82.7	55.4	40.4	14.4	5.4	41.6	0.36	2.65	NP
	GP		43.0	100	76.8	42.2	17.2	9.0	2.6	25.8			NP
	GP-GM	3.3	16.5	100	78.3	41.0	29.7	14.7	8.4	34.5	1.65	4.27	NP
	GP/SP	8.4	26.9	100		52.1	39.8	14.4	3.3	27.4			NP
	GP	10.2	45.8	100	73.9	40.0	30.8	6.9	2.9	29.0	24.2	23.0	NP
	GP/SP		38.5	100		50.7	39.8	6.0	0.9	30.5			NP
	GM/SM	5.1	17.5	100	78.1	58.0	51.5	25.5	15.0	24.3	10.9	12.1	NP
											i		
			1								i		
													<u> </u>

EXISTING TEST DATA PAGE 20 OF 20 UTAH-MEVADA STUDY AREA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 8MG

TABLE

FUERO NATIONAL IMO

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APPENDIX B
SUMMARY OF CALICHE DEVELOPMENT

DIAGNOSTIC CARBONATE MORPHOLOGY

STAGE		GRAVELL	Y SOILS	NONGRAVELLY SOILS				
I		Thin, disconti	nuouz pebble	Few filaments or faint coatings				
п		Continuous peb interpebble fi		Few to abundant nodules, flakes, filaments				
ш		Many interpebb	le fillings		Many nodules and internodular fillings			
11		Laminar horizo horizon	n overlying p	lugged	Laminar horizon overlying plugged horizon			
	STAGE		I Weak Ca	II Strong Ca		IY Indurated K		
	GRAVELLY S	OILS		(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	2 100 K			
	NONGRAYELL	Y SOILS			K			

Stages of development of a caliche profile with time. Stage I represents incipient carbonate accumulation, followed by continuous build-up of carbonate until, in Stage IV, the soil is completely plugged.

SUMMARY OF CALICHE DEVELOPMENT

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

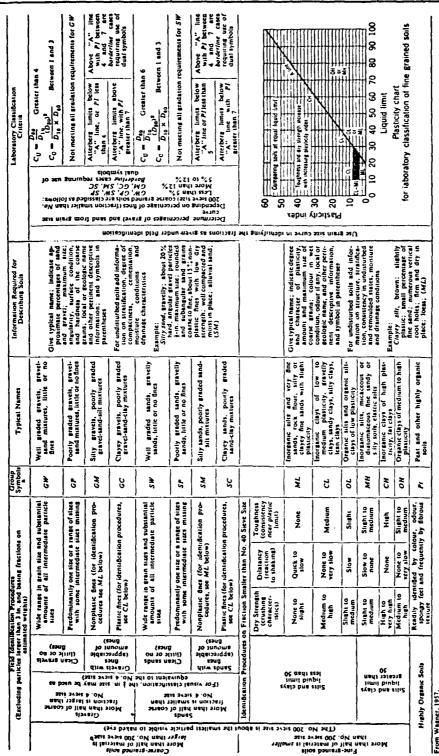
FIGURE B-1

UGRO NATIONAL INC.

Reference: Gile, L.H. Peterson, F.F., and Grossman, R.S., 1965, The K horizon: A master herizon of carbonate accumulation: Soil Science, v. 89, p. 74-82.

3 MAR 80

APPENDIX C
UNIFIED SOIL CLASSIFICATION SYSTEM



From Wagner, 1957.

• Boundary classifications. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.

• All serve aces on this chart are U.S. standard.

Field Identification Procedure for Fine Grained Soils or Freetions

Dilaboury (Reaction to Making):

After remoning purices larger than No. 40 sieve size, prepare a pat of most soil with a volume of about one-half cube rine). Add enough water (incressary to make the soil off but not sizely.

Pace the pat in the open paim of one had and shack horizontally, striking viscously assaint the other hand and serial times. A posture reaction commiss of the appearance of water on the surface of the pat which charges to a liver posture of water on the surface of the pat which charges to a liver postured of water on the surface. The rapidity of appearance of water dorning that and of its disappearance during experience during of appearance of water during that character of the first size of the pat which you appearance of water during the character of the first size as oil.

Vary first clear stands are the fundamental size, such as a signical rock about, show a moderatery quick reaction.

Firld Identification Procedure for Fine Grained Softs or Fractions

Firld Identification Procedure for Fine Grained Softs or Fractions

Firld Identification to Hashings:

Firld Identification Procedure for Fine Grained Softs or Fractions

Firld Identification or Fractions

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Toughers (Consistency near plasses lums). No. 40 sieve use, a specimen of Alest concurate principles and the second secon

simply remove by hand the coarse particles that interfere with the tests

UNIFIED SOIL CLASSIFICATION SYSTEM

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMD

NATIONAL INC

TABLE

C-1

1

APPENDIX D

UTAH-NEVADA STUDY AREA PHOTOGRAPHS



Older Lacustrine Deposit (AoI), widely scattered in the northern and western portions of the study area. Note typical moderately well to well-developed stratification in this 50-foot exposure. Class B_1 material.

UTAH-HEYADA STUDY AREA PHOTOGRAPH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMD

PHO 10 D-1

JGRO NATIONAL, INC.



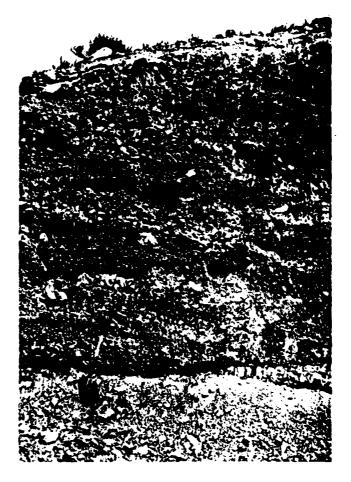
Older Lacustrine Deposit (AoI), illustrating rounded, moderately well graded sand— and gravel—sized particles with characteristic lack of fines.

UTAH-NEVADA STUDY AREA PHOTOGRAPH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BM9

D-2

JGRO NATIONAL, INC.



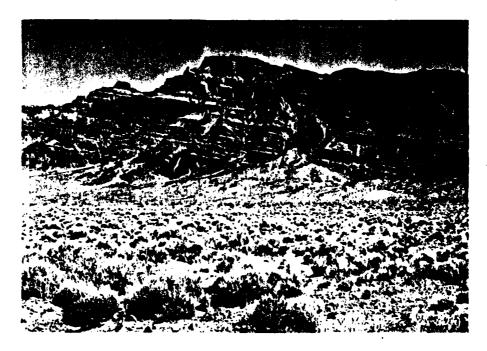
Stream-cut in Alluvial Fan Deposit (Aaf). View illustrates the crudely stratified, poorly graded mixture of cobbles, gravel, sand, and fines typical of this deposit. Note caliche coatings on cobbles and gravels. Class B material.

UTAH-NEVADA STUDY AREA PHOTOGRAPH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - 8M0

P NO TO

UGRO NATIONAL INC.



Typical carbonate rock (Cau, Ls, Do), exposure and associated alluvial fans (Aaf). Both represent potential high quality aggregate sources. Amount and type of deleterious material will cause these units to be ranked as Class B material.

UTAH-NEYADA STUDY AREA PHOTOGRAPH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

PHO TO D-4

UGRO NATIONAL, INC.



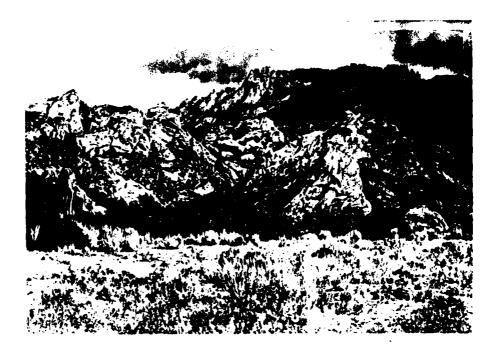
Quaternary Basalt (Vb), middle foreground. Note flat lying exposure of this 300-foot thick, mid-valley flow. Class B material.

UTAH-NEVADA STUDY AREA PHOTOGRAPH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMG

PHG 19

UGRO NATIONAL, INC.



Granitic Rock (Gr) outcrop illustrating typical jointing and weathering characteristics. Near surface portions of this unit are generally unacceptable crushed rock sources because of the high degree of weathering.

UTAH-NEVADA STUDY AREA PHOTOGRAPH

WX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMD

0-6

UGRO NATIONAL, INC.

APPENDIX E FUGRO NATIONAL GEOLOGIC UNIT CROSS REFERENCE

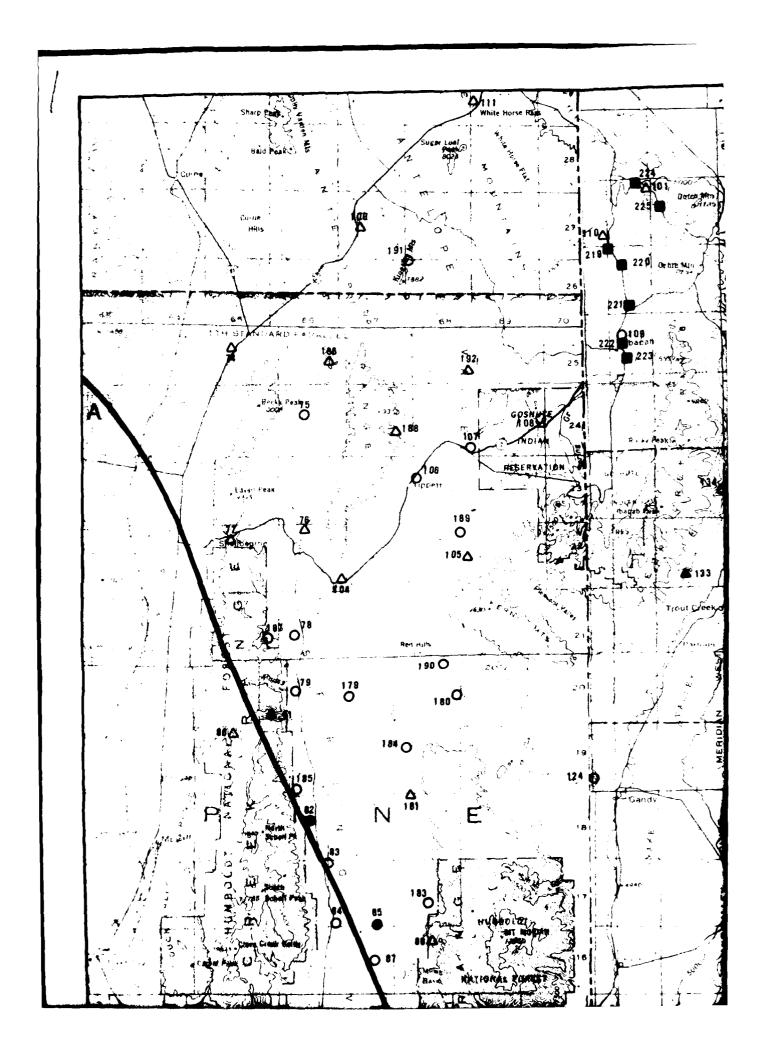
UARSA POTENTIAL SOURCE SYMBOLS

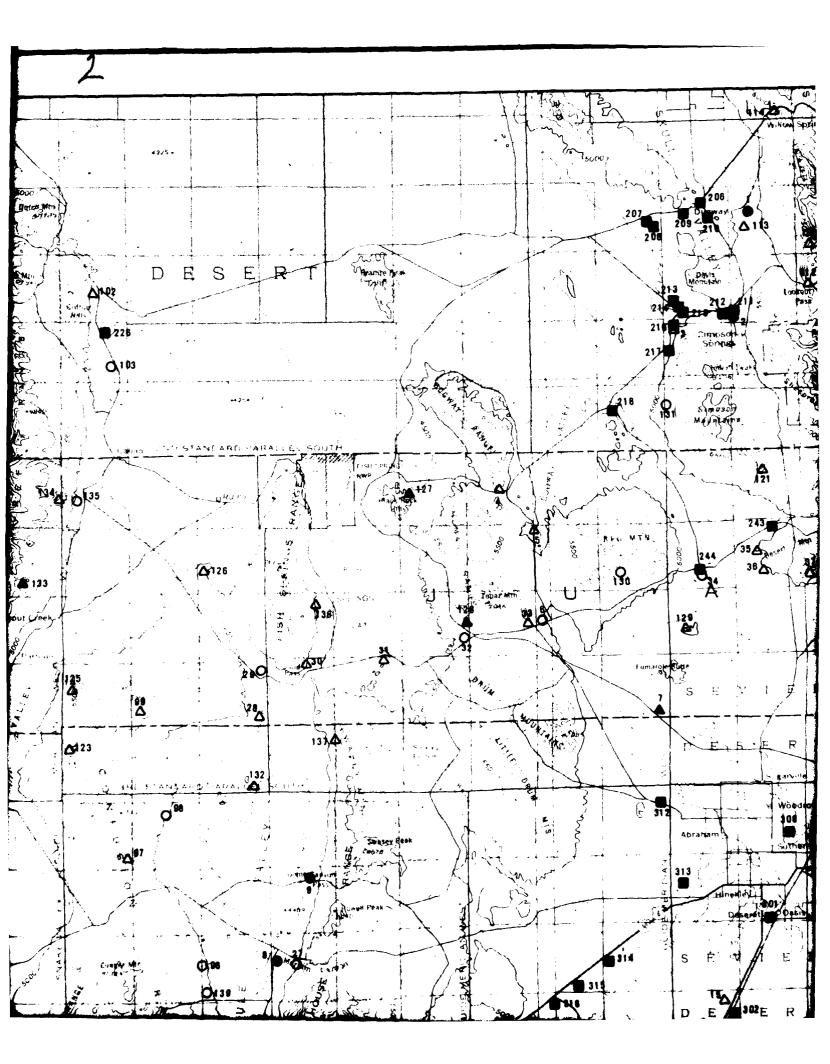
AGGREGATE FUGRO NATIONAL GENERAL GEOLOGIC UNIT EXPLANATION

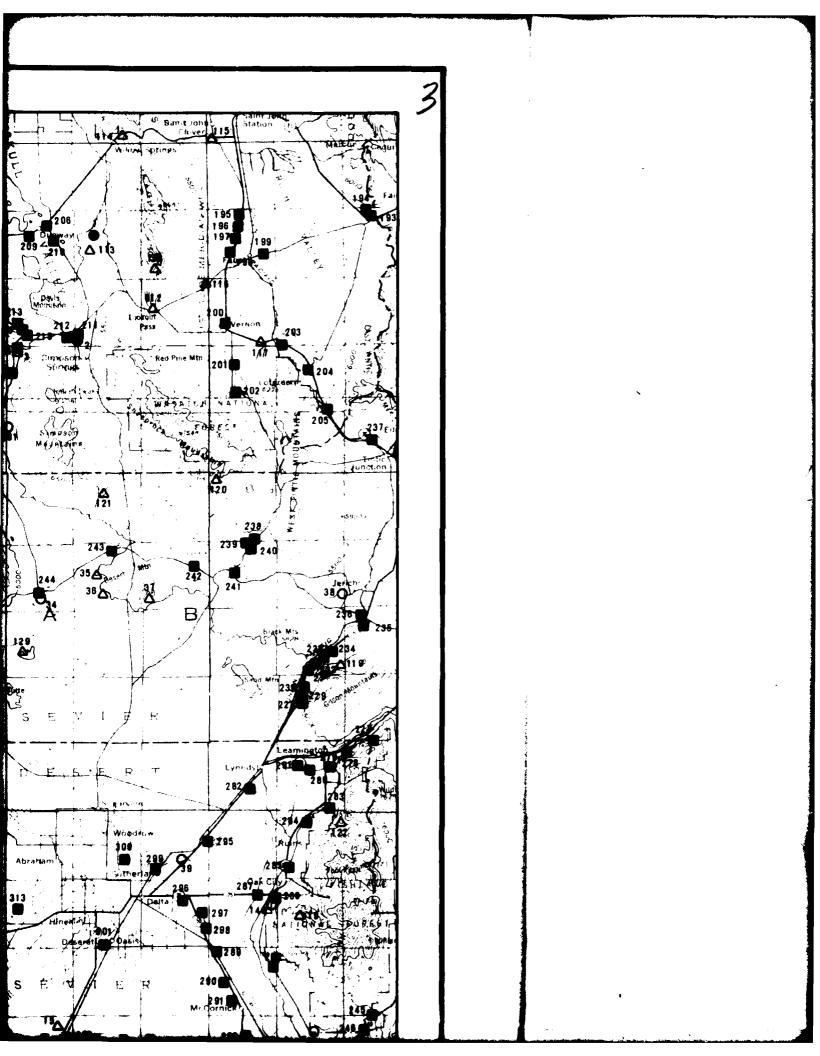
_	. 「 <u></u> _	_i <u>i </u>	
I		1661	
	ı	Tame in the one of the is present. The standing statement	
1		(greater thee 78 percent) rach lype is indicated. In these areas	
	r	followed by the substitution race type (a.g. S_{xy} /1 s_y), Both may be substituted into sectors [6].	
1			
	0	at a agripa de partially valten mss	
Ì	Gr	Fication of molten material baneath the surface	
Ì	Yu	(e.g., grante, grandierite, ejorite, gabere) [12] Extrusive (intermediate and actoic) Volcanic recks	
١		at intermediate and accidic Compagnism tended by settletication of motion material at or near the	
	٧b	13 Extracted Charles Percent rects of basic com- centum generally farmer by serial/screen of	
1	v	melten deterrais at or mear the surface ce g. besait).	
١	Yu		
	Su	S SERIMENTARY (AMBIFFERENTIATES) Rocks formed by accommistion	
Ì	· ·	5 Statemarker (comprehensings) macks formed by accomplation	
	Su, QTz		
1		of crystacrystalline spices to g one; chert)	
	Ls, Do, Cau	S) Caremate Rocks - Composed productionally of calcium calemate deficion or commissi procupitates to g timestone, delinicit, chair-	
1	ı	Sy Argeitiacones Rocks Composed of city and self-serve	
J		Su Eupprichs to g. Siltstone Shale Calystone: Su Eupprich Backs. Procisitated from selection as a	
	ę.,	cosult of evaporation to g. Na(ifo, gypsum anhydrith spirith	
ı	Su	Ss Course Clastic Rocks Composed of graves-sized or larger clasts (e.g. canglomerate broccia)	
ļ	Mu	M METAMORPHIC (UMBIFFERENTINTEN) - Rocks formed intrough re- crystacilization in the second state of producting rocks	
ĺ	Mit	by heat and prossure	
		(egional motamorphism ailber banded er granulot - g gnoiss granulita anghibatite)	
Ì	Mu		
	Mu		
	QTz		
	ı	BAS18-FILL	
ŀ	 	A BASIN-FILL DEPOSITS Fine- to contra-grained uniterials debigning principally by eine valer or gravity	
1	Aal	At Tounger Flurial Deposits Wager modern stienn	
1	Au. Aai	CHARRY and Tipodigiain deposits Az Older Fluviel Deposits - Older incised stress	
		channel and libed-plain descrits in elevated turiaces bordering major modern draimages	
	Au	Edizan Bepasits - Bind-biomn degesits of sand securing as either thin sheets (Aze) or dunes	
	î o k	(Azu)	
		active playes of older take ages and abandoned	
	Aaf	shard trees associated with estimat lakes (Acc) As Attured for Reposits - Attured pepmits consisting	
	ı	of debris flow and notice-to-id allowing most consistent fronts grading into productionally water-tails tilu- erum deposited in shifting distributory channers	
	í	mar the sain conter. Tounger (As) intermeter (As) and older (As) allevial lanc ore differen-	
		tiated by surface iet/ development, berein conditionsand present depositional programmi programmi	
	Au	As/As Bised non-rack entits. Bost probably extensive whit is	
1	Aaf		

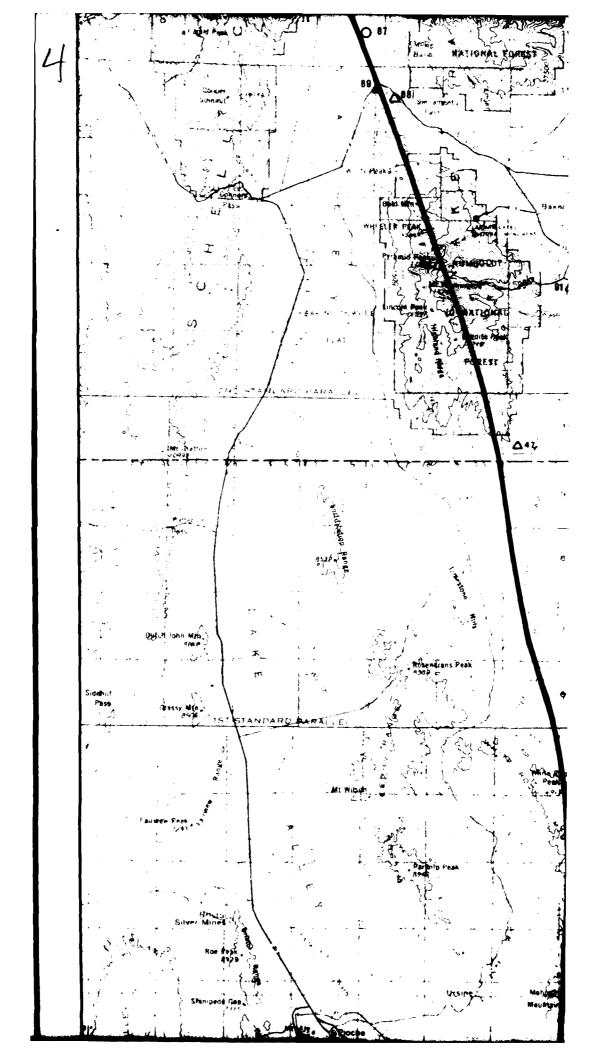
FUGRO NATIONAL GEOLOGIC UNIT CROSS REFERENCE

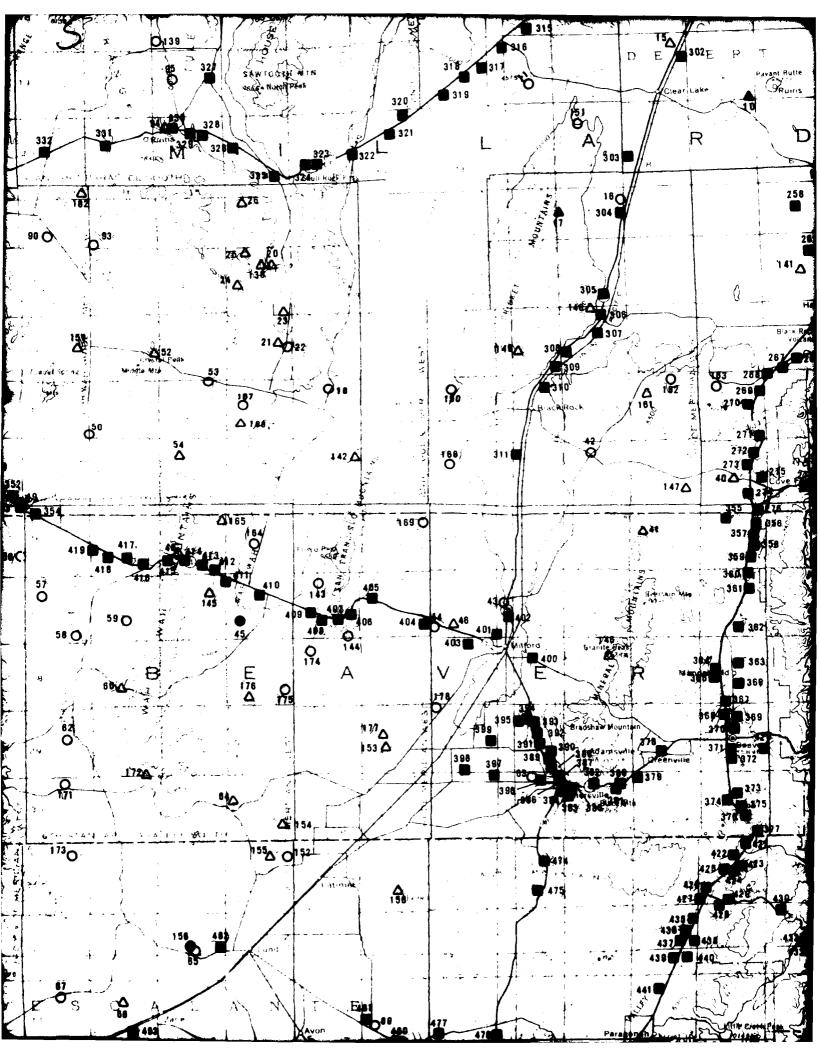
MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SMO FISURE E-1

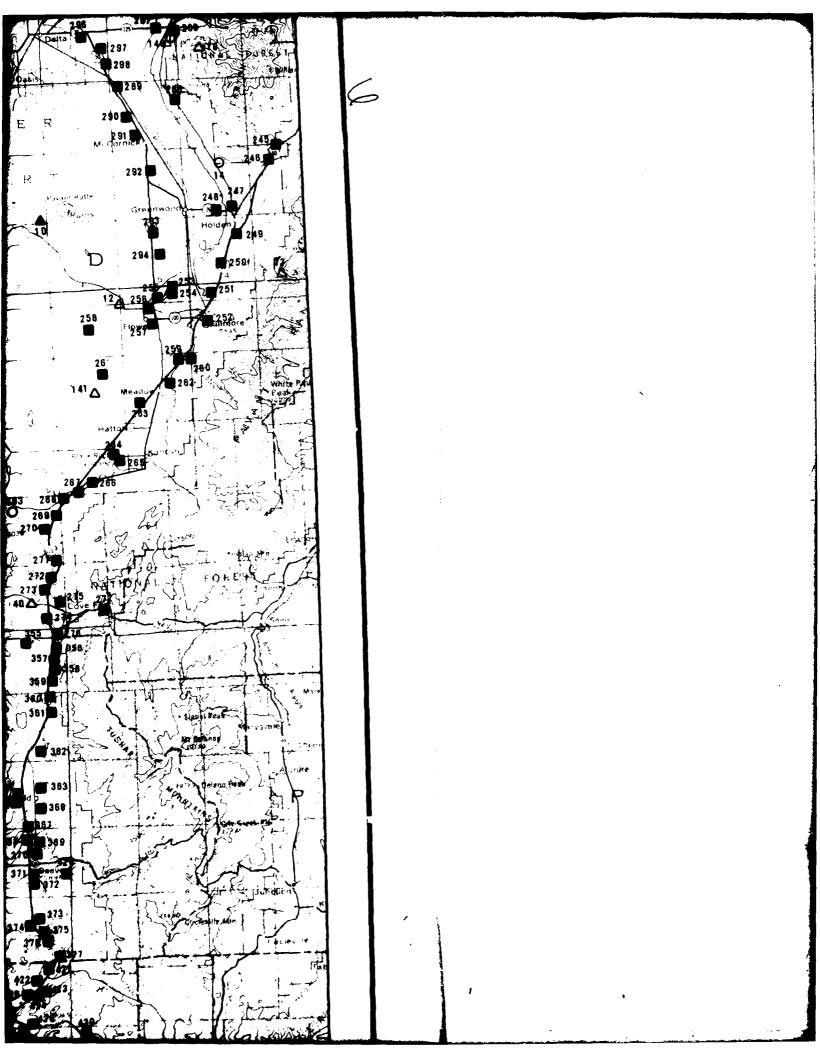


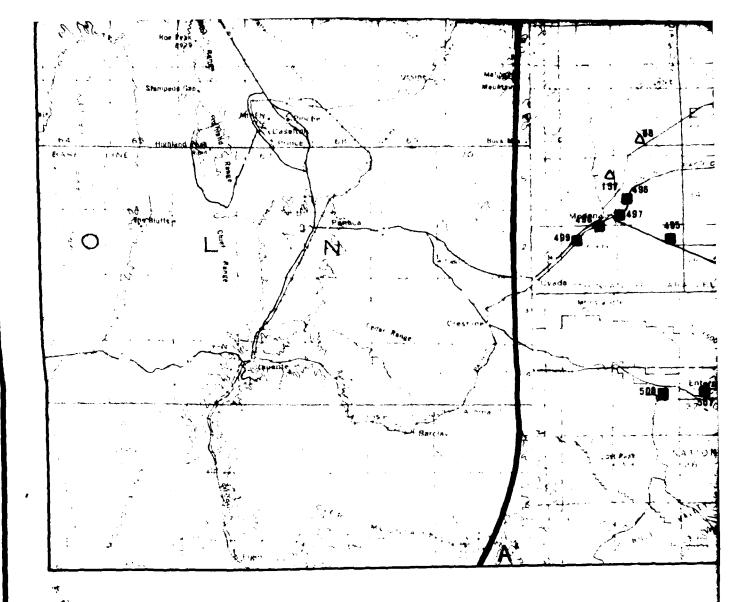












EXPLANATION

SYMBOLS

FUGRO NATIONAL FIELD STATIONS

9asin-Fill Units

- O Not sampled
- Sampled and tested

Rock Units

- △ Not sampled
- ▲ Sampled and tested

EXISTING TEST DATA SITES

■ Test deta available



EXPLANATION

SYMBOLS

FUGRO NATIONAL FIELD STATIONS

Basin-Fill Units

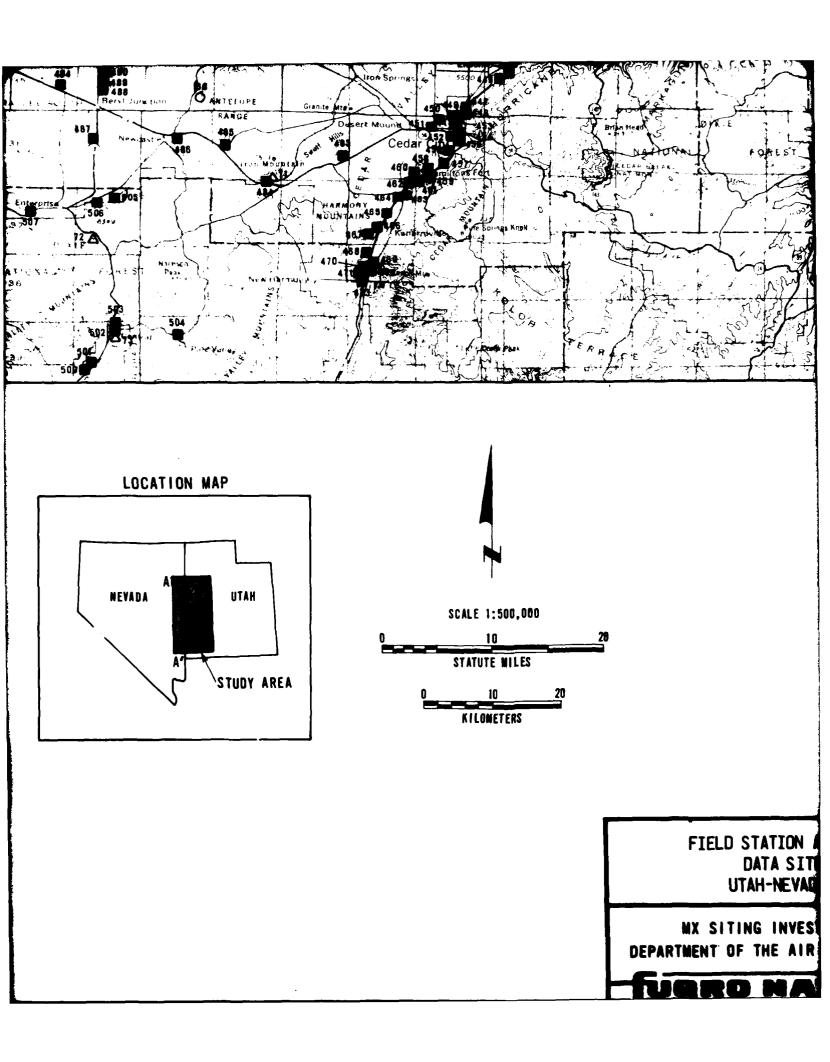
- O Not sampled
- Sampled and tested

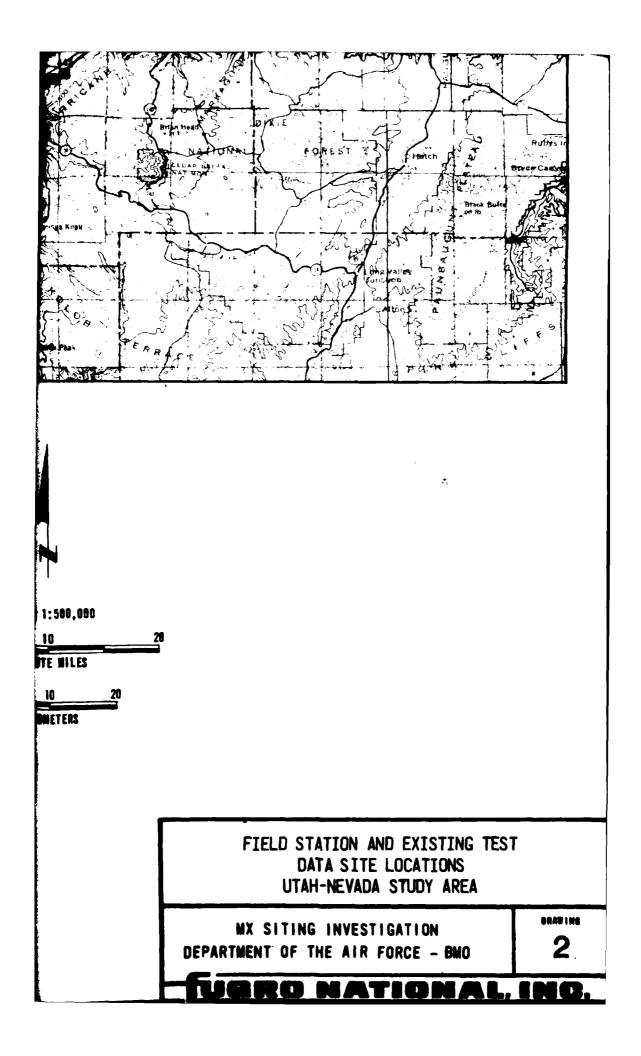
Rock Units

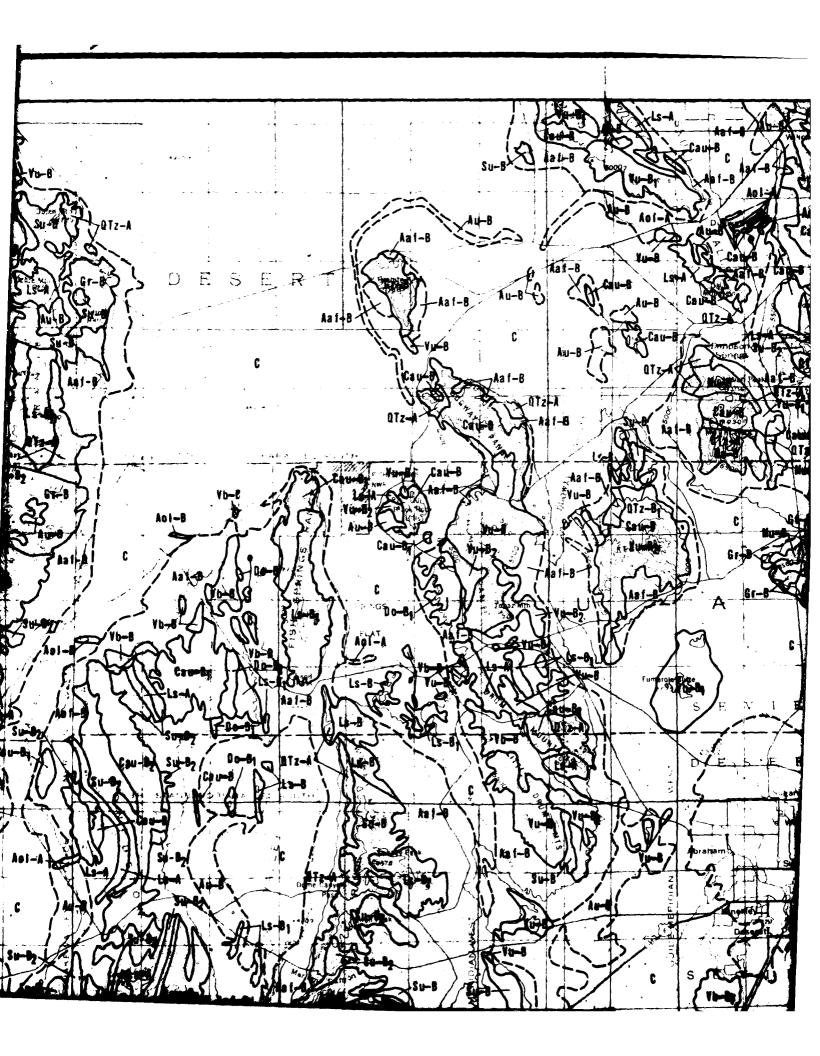
- △ Not sampled
- ▲ Sampled and tested

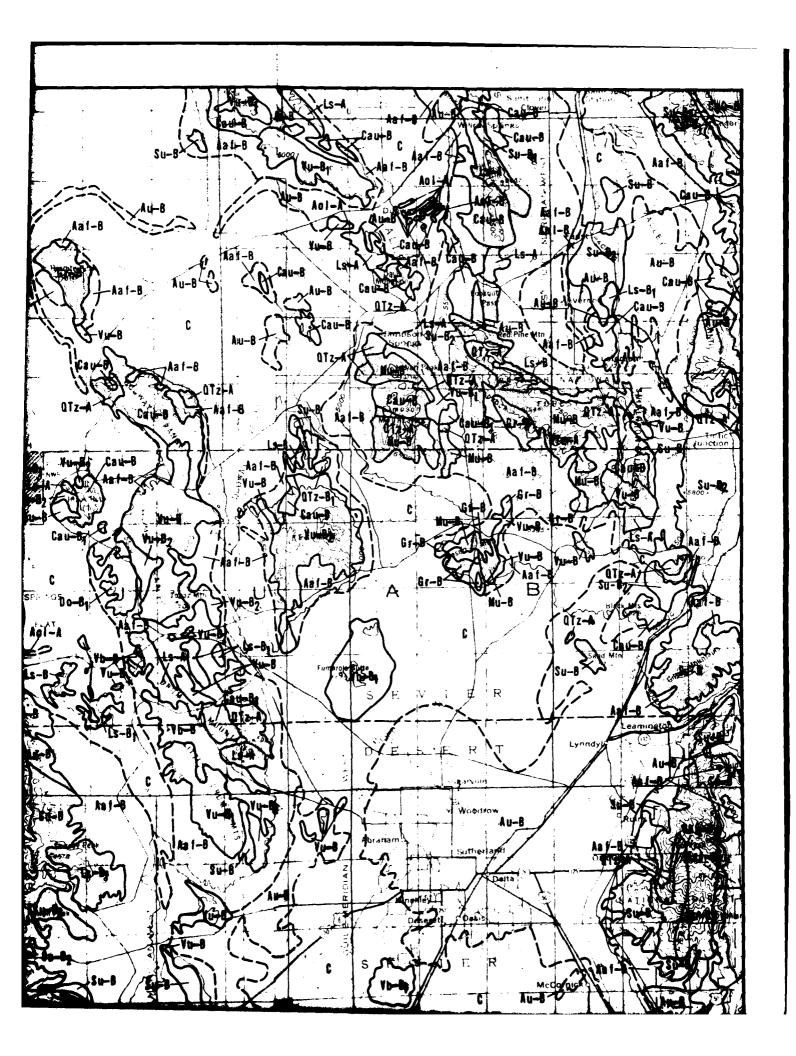
EXISTING TEST DATA SITES

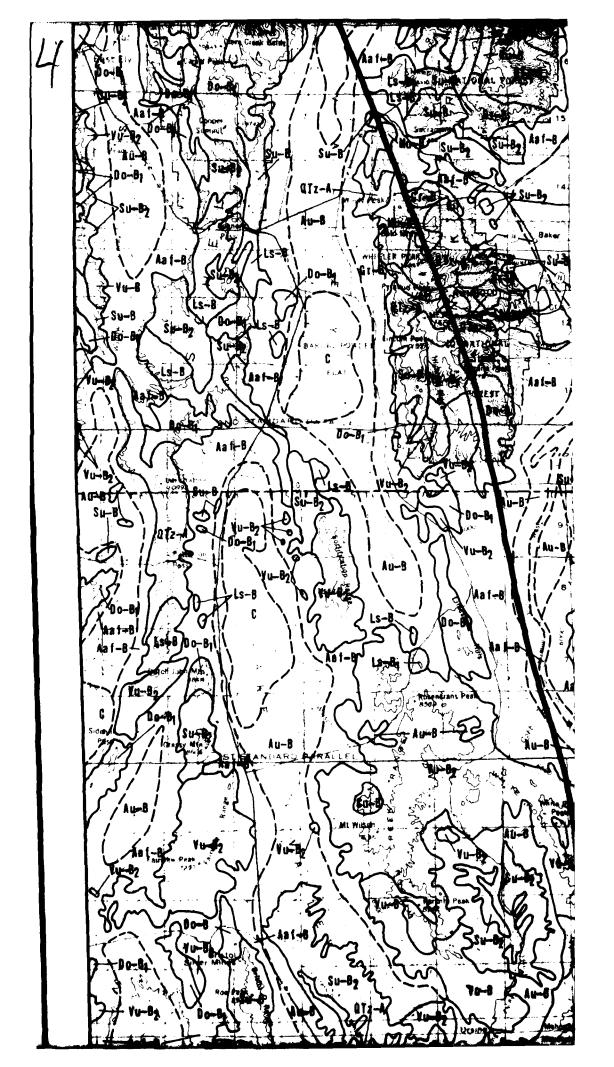
Test data available

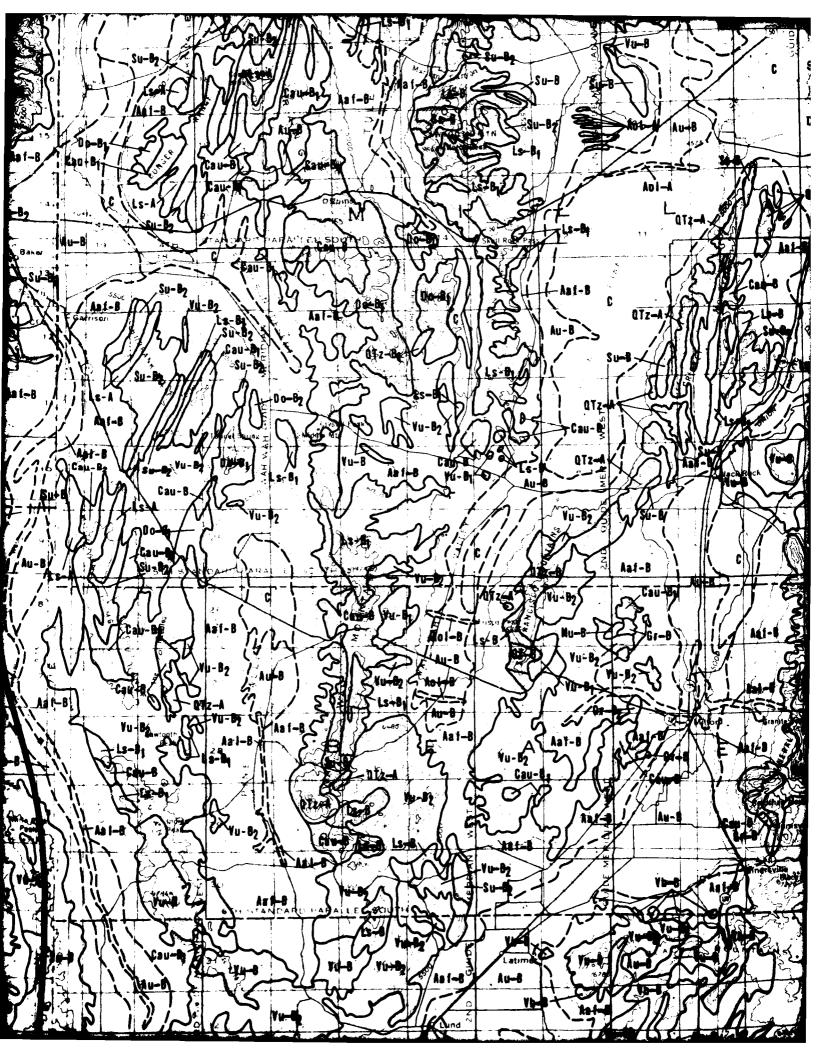


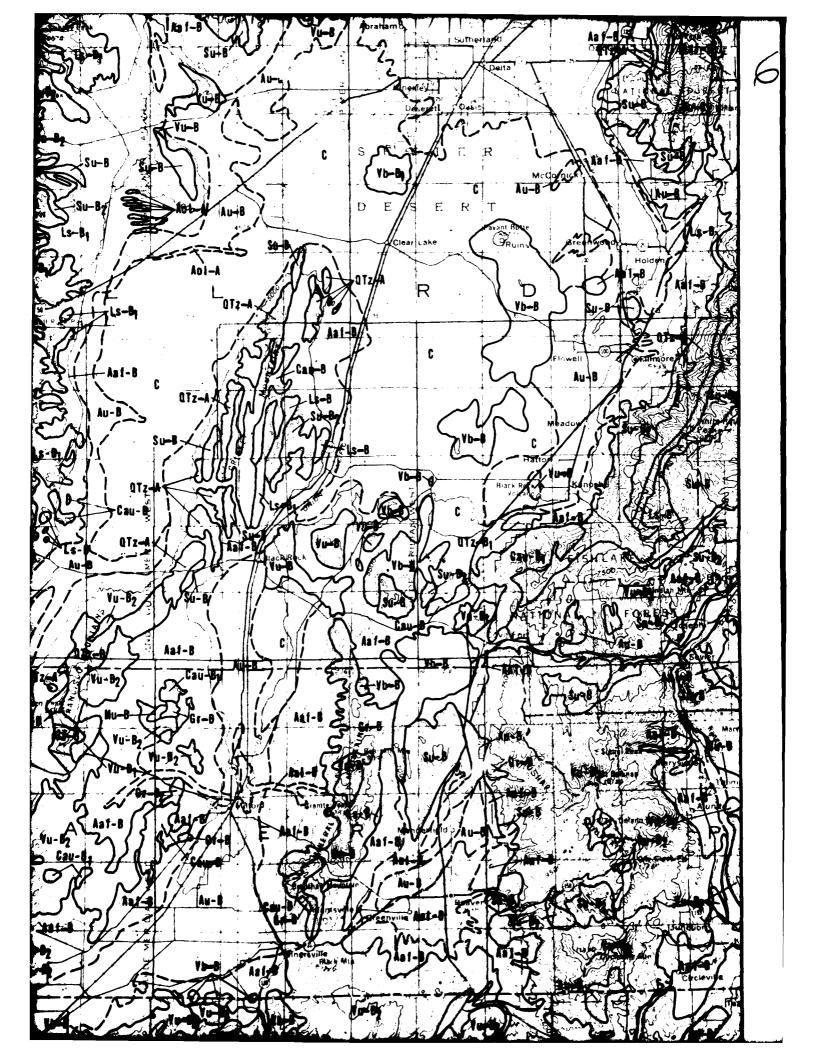


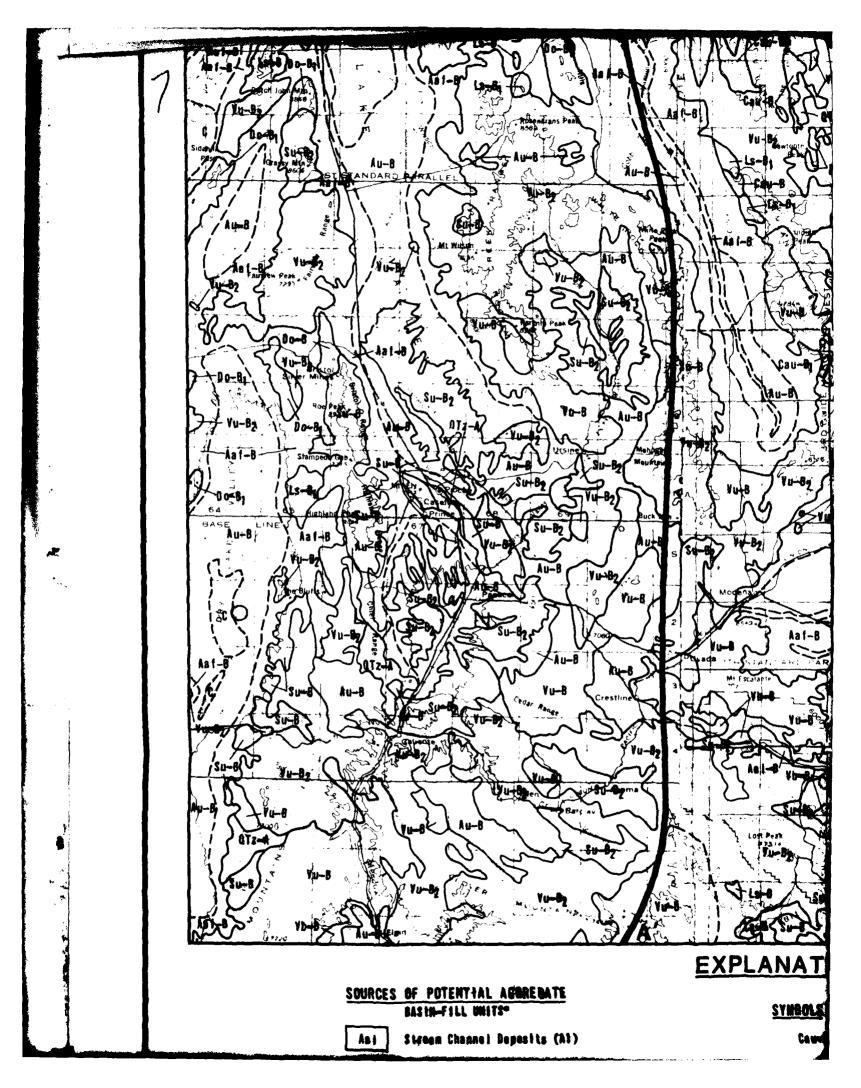


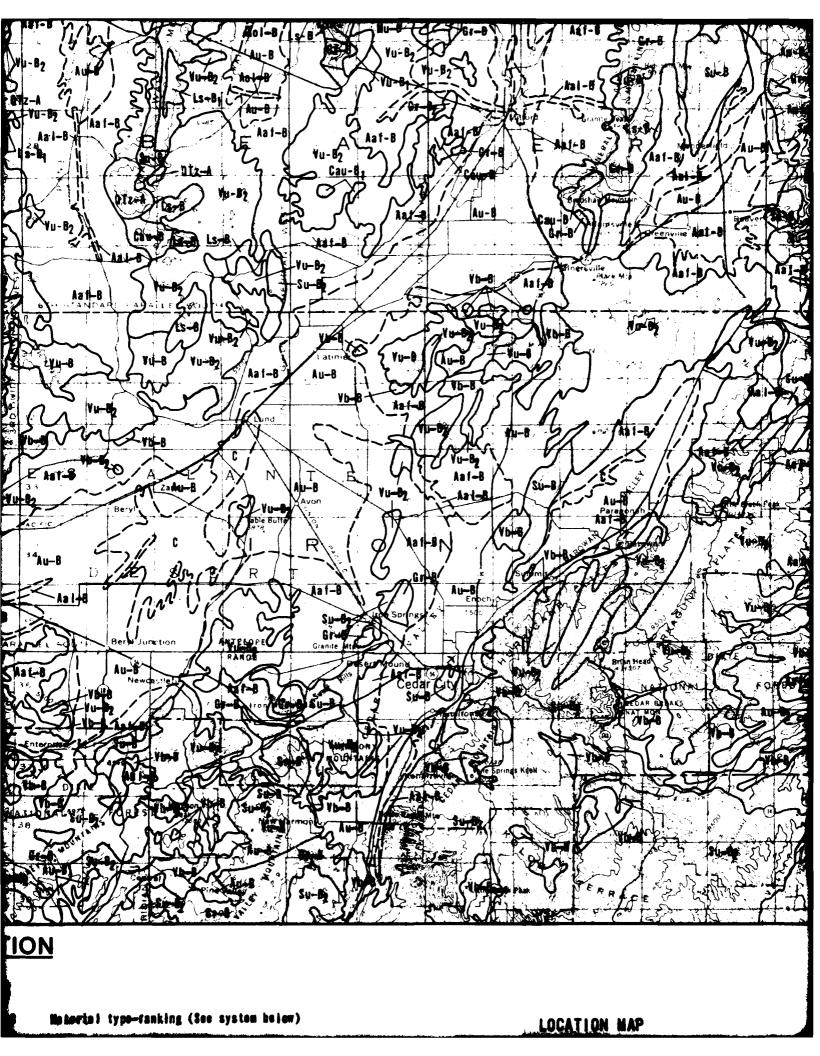


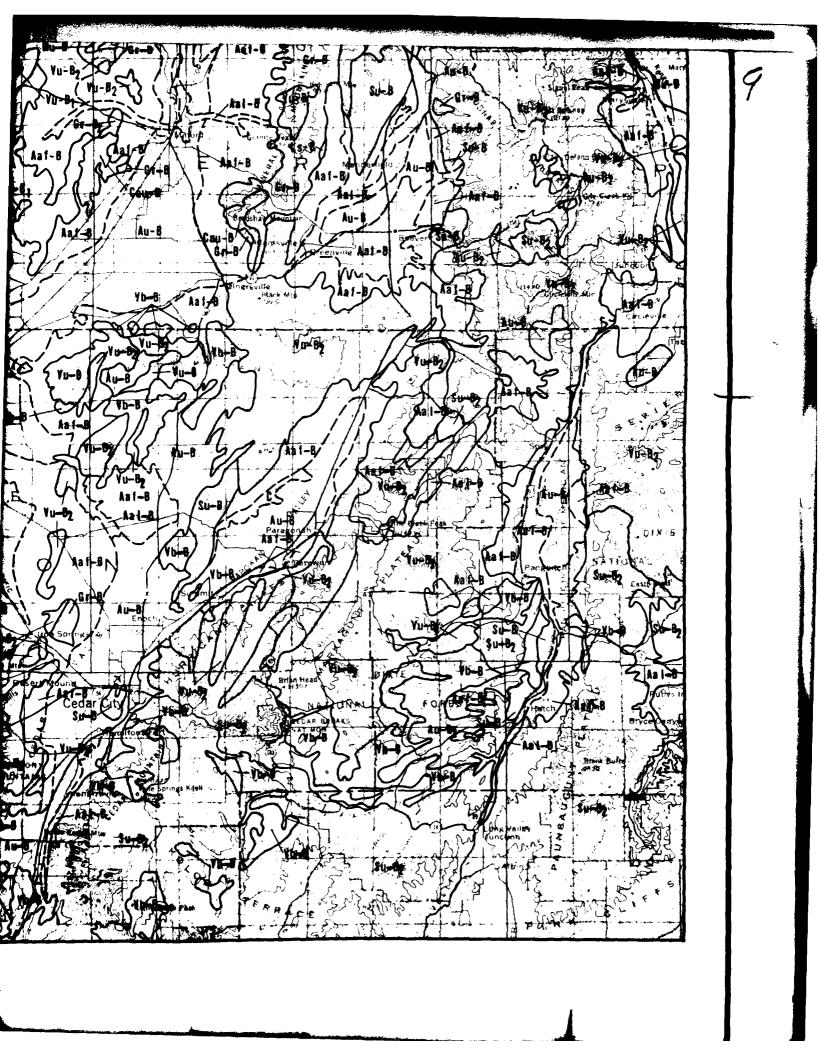


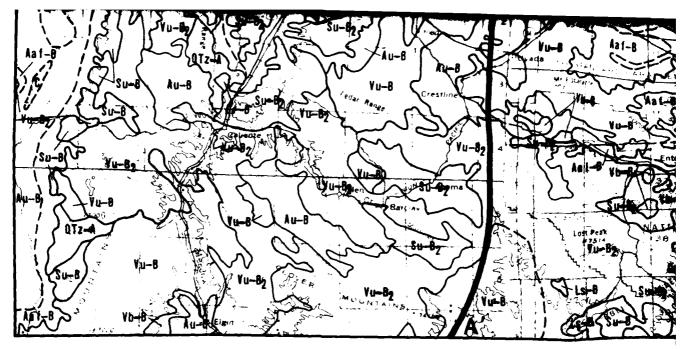






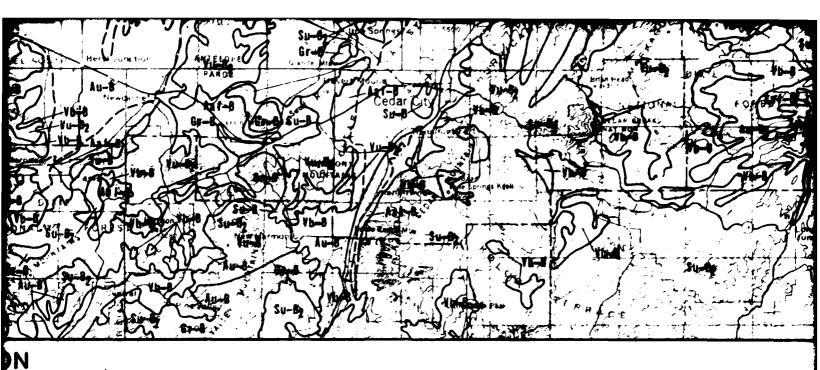






EXPLANATIO

		EAPLANATIO
SOURCES	BASIN-FILL UNITS*	SYMBOLS
Asi	Stream Channel Deposits (A1)	Cau-8
Aai	Alluvial Fan Deposits (A5)	
Aoi	Older Lacustrine Deposits (A4o)	RANKING S
Au	Alluvial Deposits Undifferentiated	CLASS A: 1
	ROCK UNITS*	1
Vb	Basait (I3)	CLASS B:
Yu	Votcanic Rocks Undifferentiated (12 and or 14)	
Gr	Granitic Rocks (II)	
tlu	Metamorphic Rocks Undifferentiated (M)	
QTz	Quartzite (M4 and for S1)	
Ls	Limestone (\$2)	CLASS C:
Do	Dolomita (S2)	
Cau	Carbonate Rocks Undifferentiated (S2)	
Su	Sedimentary Rocks Undifferentiated (S)	
	*Reference Appendix E for symbol explanation as comparison	nd



Material type-ranking (See system below)

Geologic Contact, dashed where approximate

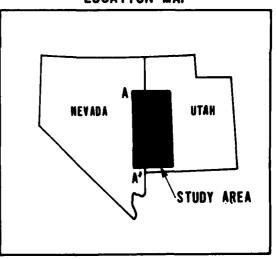
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tential sources of high quality aggregate not requiring the see of special cements or admixtures. Only nominal processing beessary to meet known requirements for concrete aggregate. Ste: Additional testing and case history studies needed to be firm adequacy and define exact characteristics of material.

otential sources of concrete aggregate exhibiting one or more odesireable characteristics which make it of poorer quality ten Class A aggregate. Detailed investigation would be equired to accurately define aggregate suitability and probable encrete characteristics. Where possible this class of material as divided into subunits B1 and B2. Materials classified as B1 considered to be generally adequate for concrete aggregate. The material is considered to be probably suitable but has everal characteristics which may make it marginal for use as a sucrete aggregate.

pterial considered undesireable for use as concrete aggregate; p geologic unit designation assigned.

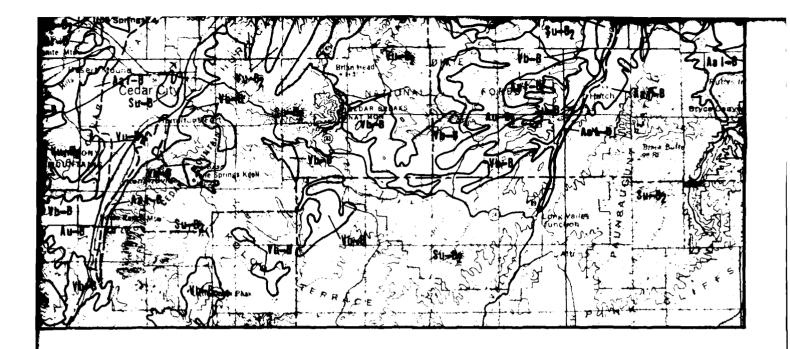




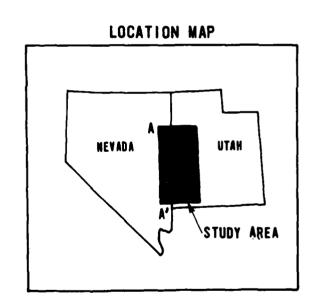
UTAH-NEVADA AGGRE

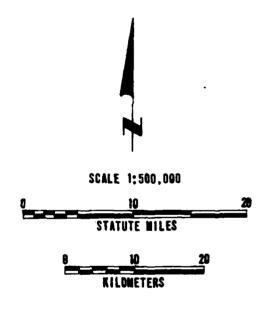
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requiring the mal processing the aggregate. It is needed to the second of the second o





crete aggregate;

UTAH-NEVADA AGGREGATE RESOURCES MAP

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DEPARTMENT OF THE AIR FORCE - 500

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